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HIRSCHHORN (ELISA). **Un nuevo parásito de 'Sorghum sudanense' en la Argentina.** [A new parasite of *Sorghum sudanense* in Argentina.]—*Rev. argent. Agron.*, viii, 3, pp. 262–263, 1 pl., 1941. [Received June, 1944.]

Cintractia [*Sphacelotheca*] *sorghi* [*R.A.M.*, xx, p. 240] was found in March, 1941, destroying the inflorescences of Sudan grass in various localities of the Province of Buenos Aires, where the crop (a new host of the smut in Argentina) serves as a valuable annual fodder.

OLIVE (L. S.). **Spermatial formation in Gymnosporangium clavipes.**—*Mycologia*, xxxvi, 2, pp. 211–214, 2 figs., 1944.

The spermatia of *Gymnosporangium clavipes* were found, upon examination of stained material, to be budded off through an open collar at the tip of each hypha. The young bud emerges through the collar and enlarges just above its rim, while nuclear division occurs in the spermatial hypha and a nucleus passes up into the developing spermatium. The mature spermatium is cut off by constriction at its base, the next bud appearing very soon in its stead at the mouth of the collar. The spermatium is thus primarily a uninucleate naked cell which originates as a bud from the protoplasm. There does not appear to be a cell wall round any of the spermatia in the cavity of the spermogonium, where they are surrounded by a liquid medium of nectar, but a thin wall may be seen round some of the spermatia among the paraphyses, and even a conspicuous one around those discharged over the surface of the fruit. The formation of the cell wall is assumed to be a secondary phenomenon associated with the transfer of the spermogonium from a liquid medium to the air.

WORMALD (H.). **A Cylindrocladium as the cause of a shoot wilt of varieties of Plum and Cherry used for rootstocks.**—*Trans. Brit. mycol. Soc.*, xxvii, 1–2, pp. 71–80, 4 pl., 3 figs., 1944.

The *Cylindrocladium* causing wilting of plum and cherry layers at East Malling [*R.A.M.*, xxiii, p. 30] has now been isolated from small pieces of the tissues from lesions on layer shoots of plum, cherry, and peach, from sclerotia present on such shoots, from spores on a wilted layer shoot of apricot, and from spores on softwood plum cuttings and their leaves in a propagating frame. On agar media these strains never developed fructifications, but some strains did when inoculated into plum or cherry leaves or green shoots kept in moist chambers.

The sporophores are either scattered or arranged in groups of 10 to 25. Each consists of a main axis unbranched to a height of 48 to 95μ; several branches then arise at or near the same level, and the axis is generally continued beyond this to a total height of 190 to 285μ, and terminates in a piriform or clavate knob 8 to 10μ in diameter. The diameter of the sporophores is 6 to 9μ at the base, tapering to 4 or 5μ just below the branching. The terminal portion of the axis is about 2μ in diameter. The branches are so disposed, the longest being below, that the ultimate branches are at approximately the same height, while the spores form a sheaf-like

cluster around or at the side of the axis. The fertile branches divide cymosely two or three times; the phialides are short cells measuring 8 to 12 by 2 to 3μ, usually slightly curved, and each terminates in a single conidium. The conidia (phialospores) are cylindrical with rounded ends, hyaline, bicellular, within the range 41 to 64 by 4 to 6μ. Sometimes one end of a spore is broader than the other by about 0·5μ. In some spores, one cell is narrower than the other for its entire length, usually by about 1μ. The conidia germinate readily and on prune agar at 25° C. form colonies 3 to 4 mm. in diameter in 48 hours.

In its sporophores and spores the fungus shows no great difference from *C. scoparium*, described by Morgan from *Gleditschia* in 1892. In its cultural characters, on the other hand, it is quite distinct from the form of *C. scoparium* found by Massey (*Phytopathology*, vii, pp. 408–417, 1917) on roses in the United States. Cultures of *C.* from Canada, two from strawberry roots and one from a raspberry root, were found to show a growth habit resembling that of strains isolated at East Malling from plum, cherry, and apricot layer shoots, and not that of the *C.* attacking roses in the United States. On the other hand, an isolate from *Acacia mollissima* roots in South Africa behaved in culture rather like Massey's fungus. In all these strains the spore size was about the same. Morgan does not mention any cultural characters, and for the present the author's fungus is regarded as a form of *C. scoparium* [*R.A.M.*, x, p. 756] Morgan distinct in its cultural characters from Massey's form on roses.

In inoculation tests in 1941, 14 plants of Common Mussel plum in one row were used. Four shoots on each plant were selected and marked, and one of the lower leaves of each was inoculated. On half the stools the midrib of each leaf for inoculation was severed by a cut. On the remaining plants the inoculum was placed on the midrib without wounding. In each batch of seven plants four were inoculated with the fungus and three with sterile agar. A monospore isolate from a Pershore plum leaf was used as inoculum. Immediately after inoculation steam-sterilized soil was added to the pots to cover the inoculated leaves. The inoculations were made on 30th May. Final counts of wilted shoots on 29th July showed that in the inoculated stools 118 shoots out of 126 (93·6 per cent.) died, compared with 8 out of 102 (or 7·8 per cent.) in the controls.

The available evidence suggests that the fungus is a soil organism. Stocks from an infected layer row should not be used for starting a fresh plot of layers. Spraying the growing shoots at earthing with Bordeaux mixture was found to reduce the risk of infection. Planting strawberries or raspberries on infected soil should be avoided for some years.

Wilson (E. E.) & Scott (C. E.). **Dormant spraying with $Ca(AsO_2)_2$ for the control of brown-rot blossom blight in Apricot trees.**—*Blue Anchor*, xx, 3, pp. 8–9, 27, 1943. [Abs. in *Chem. Abstr.*, xxxviii, 6, p. 1314, 1944.]

Applied to apricot trees in late winter, a calcium meta-arsenite spray is capable of suppressing the development of a large proportion of *Sclerotinia laxa* spores, besides destroying those already present. The compound is fairly safe on Blenheim, Royal, and Tilton apricots, but causes severe damage to almonds. In one-year trials Burton prunes and Kelsey, Sharkey, and Formosa plums were not injured by the spray at a concentration of 2 lb. per 100 gals., which did, however, damage the Pond plum; Wickson plums sustained no adverse effects from the treatment over a three-year period.

Jauch (Clotilde). **La 'viruela de la púa' en los Durazneros y Almendros del nordeste Bonaerense.** [The 'constriction disease' of Peach and Almond trees in north-eastern Buenos Aires.]—*Rev. argent. Agron.*, viii, 3, pp. 206–215, 2 pl., 1941. [Received June, 1944.]

The outstanding results of the author's studies on the 'constriction disease'

affecting peaches and almonds in north-eastern Buenos Aires and elsewhere in Argentina and in the vicinity of Montevideo, Uruguay, have already been summarized from another source [*R.A.M.*, xxi, p. 185]. In agreement with Canonaco [ibid., xv, p. 731] and J. W. Roberts [ibid., xx, p. 310], the disease is attributed to the agency of a *Phomopsis*, and not to that of *Phoma persicae* [ibid., xiv, p. 15].

HILDEBRAND (E. N.). **New strain of Agrobacterium rubi from Boysenberry.**—*Phytopathology*, xxxiv, 2, pp. 259–260, 1 fig., 1944.

Cultures derived from boysenberry (*Rubus ursinus* var. *loganobaccus*) canes severely distorted by galls near Auburn, New York, appeared to be identical in growth characters, morphology, and physiology with those of *Agrobacterium* (*Phytomonas*) [*Pseudomonas*] *rubi* [*R.A.M.*, xx, p. 373] from blackberry of an organism isolated about the same time from black raspberry (*R. occidentalis*) in a garden at Ithaca, New York. Inoculations with cultures from both boysenberry and *R. occidentalis* into new canes of the latter at midsummer resulted in the production of galls, which reappeared in the following season even after their removal by pruning down to 12 in. below the site of infection in late October, thereby affording positive evidence of the capacity of *P. rubi* to migrate through first-year canes as they approach dormancy. In comparative inoculation experiments with *A.* [*Bacterium*] *tumefaciens* and *A.* [*Bact.*] *rhizogenes*, the boysenberry strain of the cane gall organism, in contrast to that from black raspberry, stimulated within one month the development on wounded *Kalanchoë daigremontiana* stems of minute galls (2 mm. in diameter), from which *P. rubi* was reisolated and again successfully inoculated into the same host. The strain of *P. rubi* from boysenberry thus appears to be a new one extending the range of the organism beyond the genus *Rubus*.

SEN (P. K.). **Black-tip disease of the Mango.**—*Indian J. agric. Sci.*, xiii, 3, pp. 300–333, 2 figs. (1 col.), 3 diags., 3 maps, 1943.

The outstanding results of the author's studies on mango black tip, which have been in progress since 1939 and are here fully described and tabulated, have already been noticed from another source [*R.A.M.*, xxiii, p. 137]. In addition to the Province of Bihar, where these investigations were conducted, the disease has been reported from orchards in proximity to brick kilns in the widely separated regions of Bengal, the United Provinces, and the Punjab. Differences in varietal reaction to the injury appear to be connected with the number of lenticels per unit area of the skin, susceptibility coinciding with a high proportion of these structures. Practical suggestions for the reduction of black tip include the restriction of new kiln sites to a safe distance from valuable orchards—about a mile on the east and west and a half-a-mile on the north and south; stopping the working of kilns before the time of fruit-set (end of February); and the use of telescopic chimneys, 40 to 50 ft. high, to ensure dilution of the deleterious fumes.

VAN DER PLANK (J. E.). **The disinfection and protection of seed.**—*Fmg S. Afr.*, xix, 217, pp. 274–278, 1944.

This contribution, in a special seed production number of the journal, gives a brief, popular account of modern methods of seed treatment against disease.

ZÜRN (F.). **Rauchschäden und Metallhüttenindustrie. I. Säuren, insbesondere schweflige Säure, als Bestandteil der Rauchgase.** [Smoke injury and the foundry industry. I. Acids, especially sulphuric acid, as a component of smoke gases.]—*Metall u. Erz.*, xxxix, pp. 21–25, 48–51, 1942. [Abs. in *Chem. Zbl.*, cxiv (ii), 17, p. 1576, 1943.]

The influence of the acids emanating from foundry fumes, notably sulphuric acid, on plant life [cf. *R.A.M.*, xxi, p. 140] depends not only on the concentration

of the noxious principle, but also on the time of day, the season of the year, and the degree of susceptibility of the particular species involved. In this connexion the cultivation of 'smoke-resistant' plants is recommended for manufacturing centres. The symptoms of gas damage are described, control measures discussed, and full directions given for the application of various methods of investigation of the after-effects.

Humfeld (H.) & Feustel (I. C.). **Utilization of Asparagus juice in microbiological culture media.**—*Proc. Soc. exp. Biol., N.Y.*, liv, 2, pp. 232–235, 1943.

Asparagus butt juice appears to provide an excellent balance of nitrogen, sugar, and inorganic constituents for microbiological nutrition, containing 4 to 5 per cent. solids, of which the bulk is reducing sugar, and 0·07 to 0·13 per cent. total nitrogen. Cultured on this medium, *Bacillus subtilis* exerted a comparatively strong inhibitory action on the development of *Phytomonas michiganensis* [*Corynebacterium michiganense*] and other bacteria.

Sherwood (Marion B.), Falco (Elvira A.), & De Beer (E. J.). **A rapid, quantitative method for the determination of penicillin.**—*Science*, N.S., xcix, 2569, pp. 247–248, 1944.

The authors describe a new assay method for determining the potencies of antibiotic substances in terms of suitable standards. It is based on the comparison of the test solution with a standard filtrate, the liquids being added to filter paper disks placed on nutrient agar seeded with *B[acillus] subtilis*. The zone of inhibition is measured and expressed as a percentage of the standard.

Wallingford (V. H.), Homeyer (A. H.), & Gronemeyer (Harriet B.). **Inoculation of media for mold culture.**—*Science*, N.S., xcix, 2570, p. 266, 1944.

The following technique for the cultivation of *Penicillium* spp. in large flasks or bottles has been successfully employed at the Research Laboratories of the Mallinckrodt Chemical Works, St. Louis, Missouri, to obtain a uniform degree of inoculation and to produce an even growth over the entire surface of the medium. A homogeneous emulsion is prepared by warming and stirring 2·5 gm. gum tragacanth and 0·5 gm. lanoline in 100 ml. of water; 30 gm. of the mixture is placed in a 125 ml. Erlenmeyer flask together with five 12 to 15 mm. glass marbles, the flask plugged with cotton, sterilized, and then rotated or shaken to emulsify the lanoline while being cooled to 30° C. or below. The flask with the mixture can be stored in the refrigerator indefinitely. To prepare a spore suspension, the contents of one flask are poured on to a culture grown on agar in a 250 ml. flask, this shaken gently for several minutes in a horizontal plane, and 25 ml. of sterile water added to dilute the suspension. The inoculated flasks are thoroughly shaken and then incubated.

Wilkins (W. H.) & Harris (G. C. M.). **Estimation of the anti-bacterial activity of fungi that are difficult to grow on liquid media.**—*Nature, Lond.*, cliii, 3889, pp. 590–591, 1 fig., 1944.

To estimate the anti-bacterial activity of fungi that do not grow well in liquid media, the authors devised the following test, preliminary to that generally used in the Mycology Laboratory of the Department of Botany, Oxford University [*R.A.M.*, xxiii, p. 56]. A pure culture of the fungus is grown as a plate colony on 20 ml. of its most favourable medium (the most generally useful is 2 per cent. malt extract in distilled or tap water with 2 per cent. agar) and allowed to grow until it has attained a diameter of about 2 to 2½ in., which may be anything from one to three weeks after inoculation; plates are then poured containing 20 ml. of nutrient agar to which has been added a suspension of the bacteria against which the test is to be made, and allowed to cool to between 50° and 45° C.; a disk of mycelium

and agar is cut from the fungus colony and dropped into the centre of the still warm bacterial plate, which is incubated at 37° overnight. Next morning, if bacteriostatic substances have been produced, there is a clear, bacteria-free zone around the edge of the disk. In the author's experience, the outcome of this test indicates the type of result to be expected if the fungus were to be grown in liquid medium. This procedure helps, therefore, to shorten the experimentation time, as the negative fungi can be eliminated forthwith.

HANSEN (H. N.) & SNYDER (W. C.). **Relation of dual phenomenon in Penicillium notatum to penicillin production.**—*Science*, N.S., xcix, 2570, pp. 264–265, 1944.

The results of a single-spore analysis of a stock culture of *Penicillium notatum* showed it to be a dual fungus [cf. *R.A.M.*, xxii, p. 490], composed of two physiologically as well as morphologically distinct constituents, namely a normal conidial or *C* type and an abnormal mycelial or *M* type. The *M* type, non-sporulating and producing a yellow pigment, was observed to arise repeatedly as a mutation in ageing colonies of the *C* type, even in cultures started from a single conidium, and is considered to be a function of physiological age. Pure cultures of the *C* type which are maintained in a state of youth by frequent transfers (conidia) tend to remain free of the *M* type. The *M* type is presumed to be the form which various workers have reported as being a poor producer of penicillin, and it is suggested that the highest yield of penicillin could probably be obtained by making frequent single-spore cultures of the fungus, selecting the most productive clone, and keeping this monotypically pure and free from recurring mutants.

FURRY (MARGARET S.) & ZAMETKIN (MARIAN). **Soil suspension method for testing mildew resistance of treated fabrics.**—*Amer. Dyest. Reptr*, xxxii, 19, pp. 395–398, 1 fig., 1 graph, 1943.

Full details are given of a method of testing mildew resistance in treated military fabrics of various types [see next abstract] by a method involving the inoculation of strips of the materials with a suspension of composted soil and their incubation for 10 to 14 days in the synthetic medium of Greathouse *et al.* [*R.A.M.*, xxiii, p. 266]. The soil used for the suspension was shown by inoculation tests on cotton duck to contain a variety of micro-organisms, of which *Chaetomium globosum*, *Metarrhizium* sp., and a species of *Fusarium* caused complete deterioration of the fabric, colouring it yellow-grey, yellow-green, and yellow-black, respectively, while the following were responsible for 60 to 75 per cent. loss of strength: *Acrostalagmus albus*, *Alternaria*, *Cladosporium*, *F.*, *Helminthosporium*, and *Papulaspora* spp., and one species of *Penicillium*; most of these moulds turned the fabric grey.

Five out of nine finishing treatments applied to 7 oz. cotton osnaburg were found to be satisfactory by the soil-suspension procedure, viz., 30 minutes' immersion in copper naphthenate emulsion, 20 gm. per 100 ml. water, at 25° to 30° C., the same period in cuprammonium hydroxide, 10 gm. per 100 ml., same temperature; ten minutes in a mixture of 1 per cent. lead acetate and 0·3 per cent. potassium dichromate, same temperature; and 16 to 18 hours in the natural dye extracts, cutch and osage orange [*Toxylon pomiferum*], both at 0·6 per cent., with copper sulphate 0·3 per cent. and the same amount of potassium dichromate, at a temperature of 100°. Two baths were given for the last three treatments. One of the other treatments, consisting of ten minutes' immersion at 100° in copper sulphate and soap (10 and 1 per cent., respectively), also afforded considerable protection, involving a loss of 25 per cent. in breaking strength compared with a maximum of 11 for the more effective procedures. In another test it was shown that a minimum of 0·5 per cent. copper in the form of copper oleate and resinate was required for adequate mildew control, as against 0·65 per cent. copper naphthenate [loc. cit.], the protective action of the latter, however, being more lasting.

Bertolet (E. C.). **Observations on soil burial procedures.**—*Amer. Dyest. Reptr*, xxxiii, 1, pp. 21–24, 1944.

The method of soil burial for the testing of mildew resistance in fabrics used for various military purposes at Jeffersonville Quartermaster Depot [*R.A.M.*, xxiii, p. 71] differs in certain respects from the specifications laid down in the American Society for Testing Materials Standards, 1942 [ibid., xxii, p. 359]. For instance, the test specimens measure 6 by 4 in. cut with the longer dimensions parallel to the filling instead of 6 by 3 cut warpwise. Twelve instead of 20 samples of each fabric are cut, six for control purposes. The specimens are completely buried at a depth of $\frac{1}{4}$ in. for 14 days at 75°±5° F. in place of the vertical partially exposed burial at 1 in. for six weeks at 90°±5°. Water-repellent finishes assist materially in the retention of the mildew inhibitor, and are applied to most of the fabrics tested.

In recent trials, 12·29 oz. duck containing 0·95 per cent. pentachlorphenol and resistant to fire, water, and weather was buried at depths of up to 4 in. for as long as six weeks without loss. When the same stuff was exposed to four months' weathering out-of-doors, followed by 14 days' soil burial, it lost 30 per cent. of its tensile strength. Water-repellent duck Nos. 4, 6, and 10, vat-dyed olive-drab No. 7, containing 0·46, 0·32, and 0·28 per cent. copper, respectively, were buried for as long as six weeks without loss, while water-repellent olive-drab No. 4 9·85 duck, containing 1 per cent. dihydroxydichlordiphenylmethane survived three weeks' burial with no loss of strength, both before and after leaching. Promising results were also obtained by the application of 0·75 per cent. phenyl mercuric triethanolamine lactate to water-repellent 9·85 and 12·29 oz. camouflage printed duck for use in jungle equipment, which withstood seven days' soil burial in a satisfactory condition; the data relating to longer periods of exposure were inconsistent, and actual service tests are necessary to establish the utility of the treatment.

Greeves-Carpenter (C. F.). **A mildew-proofing treatment.**—*Text. Mfr, Manchr*, lxx, 830, p. 82, 1 fig., 1944.

The problem of immunizing fabrics against mildew-forming bacteria and fungi—one of the most serious difficulties of the textile industry—is engaging the attention of Dr. F. J. Sowa in the United States. He claims the successful development of a series of chemical formulations which are now protecting many millions of yards of camouflage cloth, mosquito netting, and other military fabrics [see preceding abstracts] against infection, e.g. by *Aspergillus amstelodami*, *A. fumigatus*, *A. niger*, *Chaetomium globosum*, *Penicillium digitatum*, and *Scopulariopsis brevicaulis*.

The formulations are described as a group of complex organo-mercurial compounds covered by patent applications and differing radically in their structure from the common inorganic mercury salts, which tend to precipitate cumulative and toxic protein-type substances. With suitable modifications, the basic formulations can be adjusted to insure compatibility with all types of finishes. The process is known as 'Puratized', and at present the entire output of the requisite chemicals (except a small amount set aside for test purposes) is reserved for contractors supplying the United States Government with military fabrics. Various types of the process appropriate for specific purposes are indicated.

McCubbin (W. A.). **Relation of spore dimensions to their rate of fall.**—*Phytopathology*, xxxiii, 2, pp. 230–234, 1 graph, 1944.

On the basis of available information on the rate of spore fall in still air published by A. H. R. Buller (Researches on Fungi [I, 1909]), W. A. McCubbin (*Phytopathology*, viii, pp. 35–36, 1918), and J. J. Christensen [*R.A.M.*, xxiii, p. 140], an attempt was made to establish a relation to spore dimensions permitting the reasonably accurate determination of the probable speed of fall of any spore. The published

rates of fall (mm. per second) (r) for 20 species are tabulated together with spore measurements in microns, the product of the spore dimensions ($l \times w$), the square root of the product and the ratio of $\frac{l \times w}{r}$, and in a graph the observed rates of fall for 19 (excluding *Helminthosporium sativum* on account of its anomalous position as regards shape from the standpoint of the present studies) are plotted against spore diameters to give the point series. There is further included a curve representing an arbitrary series of the values $\frac{l \times w}{40}$ (the average $\frac{l \times w}{\text{rate of fall}}$ for the 19 species was 39·67) or their equivalents, $\frac{d2}{40}$ (d = spore diameters), similarly plotted against spore diameters, the perpendicular scale thus serving to represent mm. per second for the rate-of-fall series and microns for the derived curve. A reasonably good coincidence between these curves is evident, and in so far as this coincidence may be relied upon a relation is established between simple spore dimensions and observed rates of fall, which may be used to predict the probable velocity of fall of any spore in the type group comprising spherical and oval spores, as well as those of cylindrical shape with hemispherical ends. The formula expressing this relation is: $\frac{l \times w}{40} = r$, the symbols to be used in the sense already indicated. Modifications of this formula are suggested for double-coned and fusiform spores. The spores of *H. sativum* were omitted from the initial calculation because they fall into a spore group belonging to the fusiform types.

No high degree of accuracy should be expected from the formulae given as they are derived from only a few determinations, but it is hoped that further spore-fall determinations will enable them to be revised to bring them into closer relationship with reality.

Robbins (W. J.) & Ma (Roberta). **Pseudopyridoxine and certain fungi.**—*Proc. nat. Acad. Sci., Wash.*, xxix, 6, pp. 172–176, 1943.

Continuing their earlier studies [*R.A.M.*, xxii, p. 218], the authors found that *Ophiostoma catonianum*, *Ceratostomella ips* No. 255, *C. montium*, *C. microspora*, *C. multiannulata*, *C. piliferum*, *C. pluriannulata*, and *C. ulmi* responded to pyridoxin as such. The physiological activity of pyridoxin was not replaced by *dl*-alanine. No evidence was obtained from these fungi of the existence of E. E. Snell's more active pseudopyridoxin.

Stokes (J. L.), Gunness (Marion), & Foster (J. W.). **Vitamin content of ingredients of microbiological media.**—*J. Bact.*, xlvii, 3, pp. 293–299, 1944.

Some dehydrated ingredients of microbiological culture media in common use, e.g., the various peptones, yeast and meat extracts, and the like, were assayed for their content of thiamin, riboflavin, panthothenic acid, nicotinic acid, biotin, pyridoxin, folic acid (the name originally applied by H. K. Mitchell *et al.*, *J. Amer. chem. Soc.*, lxiii, p. 2284, 1941, to a factor in spinach essential to the growth of *Steptococcus lactis* R and *Lactobacillus* spp., and here used to cover any substitute for this factor in the development of *L. casei*), and para-aminobenzoic acid. The vitamin values of these ingredients are compared with the amounts recorded in the relevant literature as requisite for the optimum growth of various micro-organisms. The following were the requirements (in microgm. per c.c. of medium) of the fungi included in the tests: *Saccharomyces cerevisiae*, 0·00007 biotin and 0·004 pyridoxin; *Rhodotorula rubra* and *R. flava*, 0·016 thiamin; *Phycomyces blakesleeanus*, 0·02 thiamin; *Neurospora sitophila* and *N. crassa*, 0·10 pyridoxin and 0·0025 para-

aminobenzoic acid, respectively, and *Ceratostomella ulmi*, 0·03 pyridoxin [*R.A.M.*, xxii, p. 218].

VAN DER PLANK (J. E.). **Production of seed Potatoes in a hot, dry climate.**—*Nature, Lond.*, cliii, 3889, pp. 589–590, 1944.

Studies in South Africa showed that very high temperatures and low humidities check the flight of aphids that transmit potato virus diseases [cf. *R.A.M.*, xxiii, p. 274]. These results, in conjunction with the findings of other workers that low temperatures and high relative humidities have the same effect, are taken to indicate that at both ends of the scale there is an extreme at which the potato will thrive, but not the aphids, and that it is in the intermediate climates that heavy infestation may be expected to occur. Under field conditions, there appeared to be an optimum temperature for the aphids *Myzus persicae* and *Macrosiphum solanifolii* [*M. gei*] at which infestation is at a peak, and rising temperatures above this optimum progressively reduce the aphid population until a point is reached when the average daily maximum temperature for the summer months is 32° C., at which it virtually disappears. It is pointed out, however, that this applies only to the above-mentioned aphids on potato, and that high temperatures will not control all aphids on all crops.

At Kimberley, winter rains, which favour the aphids, are stated to be negligible, and the rising temperatures in early spring with the resulting dryness of the air keeps the aphids in check, so that two crops of potatoes can safely be grown per year. Aphid counts carried out during three seasons on thousands of leaves in hundreds of acres of potato in all stages of growth at the Vaal Harts and Riet River irrigation settlements near Kimberley showed, for *Myzus persicae*, an average of 1·1 per 100 expanded compound leaves, the highest record being 3·6 per 100 in April, when the danger of virus spreading was presumably almost past. Over 1,000 tons of seed potatoes raised in 1943 by the State in these two settlements proved to be the best ever available in bulk in the country. The only variety so far produced in quantity in South Africa is Up-to-Date, which is field-immune from virus A and manifests symptoms in hot weather of all other potato virus except X, but a start has been made with Katahdin.

GRADINAROFF (L.). **Ueber die Aetiologie komplexbedingter Knollenfäulen bei der Kartoffel.** [On the etiology of Potato tuber rots of complex genesis.]—*Arb. biol. Anst. (Reichsanst.), Berl.*, xxiii, 4, pp. 405–428, 3 figs., 1 diag., 1943.

A comprehensive, tabulated survey is given of the writer's studies at the Bureau of Genetics and Plant Breeding, Sofia, Bulgaria, on potato tuber rots of complex etiology, the outstanding results of which may be summarized as follows. In inoculation experiments with *Fusarium avenaceum*, *F. sambucinum*, *F. culmorum*, *F. solani*, and its var. *martii*, obtained from Dr. Wollenweber and grown on 2 per cent. malt extract agar, the fungi failed to cause rotting of the tubers, but the five varieties tested did not react uniformly to infection. For instance, *F. avenaceum* induced moderate necrosis and slight aerial mycelium formation round the site of inoculation in Erstling [Duke of York], Frühgold, Flava (necrosis of variable extent), and Erdgold, while in Ackersegen the necrotic symptoms were severe, though the amount of mycelium was no greater than on the other varieties. *F. sambucinum* was responsible for severe necrosis in Flava and Erdgold, moderate in Frühgold, slight in Duke of York, and none in Ackersegen, with sparse mycelial growth in all except Flava. Moderate necrosis was induced by *F. culmorum* in Duke of York, Frühgold, and Erdgold, slight in Flava, and none in Ackersegen, accompanied by scanty mycelial growth in the three last-named varieties. Frühgold did not respond in any way to inoculation with *F. solani*, which also further caused only mild symptoms in the other varieties, whereas its var. *martii* produced extensive necrosis

on Duke of York and Ackersegen, moderate on Erdgold, and slight on Flava; mycelial development in this species was slight in Duke of York and Erdgold, variable in Frühgold, and absent in Ackersegen. *F. solani* var. *martii* was the only one of the species tested to produce conidia in fluctuating amounts on Duke of York, Frühgold, and Erdgold. In comparative trials with the ubiquitous moulds, *Penicillium glaucum*, *Aspergillus niger*, and *Rhizopus nigricans* [*R. stolonifer*], only the last-named caused any necrosis, and that slight, in Duke of York and Ackersegen. In this connexion it may be of interest to note that the ordinarily saprophytic *A. niger* was found by K. O. Müller in Anatolia, Turkey (unpublished report to the Turkish Ministry of Agriculture, 1928–9) developing in such profusion on grapes as to render the crop worthless for processing into currants. From the same source it was learnt that *R. stolonifer* was responsible for a decay of sunflower stems immediately below the inflorescences in Adana, Turkey.

Tubers attacked by *Phytophthora infestans*, especially those of Flava, provide a favourable nutrient substratum for *F.* spp. and *R. stolonifer*, which do not, however, behave as pure saprophytes in this instance, since they colonize the infected tissues before the cells have undergone complete necrosis. At the same time, the well-known late blight syndrome presents a modified aspect, the characteristic brown discoloration of the diseased tissues (phlobaphen formation in the collapsed cells) being absent or inconspicuous, while a prominent feature is liquefaction of the tuber tissues associated with the dissolution of the middle lamellae by the 'adventitious' fungi. In the case of varieties semi-resistant to late blight, such as the 'W' types, BRA 6/33, BRA 9/31, and BRA 13/31 [*R.A.M.*, xxi, p. 501], the secondary invaders do not thrive, probably, as K. O. Müller suggests, owing to the secretion in the host cells undergoing necrotic dissolution of an inhibitory microbicidal substance. Living Duke of York and Ackersegen tubers exposed before inoculation to supra-maximal temperatures (30°, 35°, 40°, and 45° C.) acquired a susceptible reaction to fungi incapable of attacking normal material, more particularly *R. stolonifer* and *F. culmorum*. On the other hand, the development of *P. infestans* on pre-treated susceptible tubers was scantier than on the controls, indicating that a decline in vitality does not necessarily connote any weakening of resistance to late blight. In the case of the resistant BRA 6/33, the high-temperature pre-treatment neither decreased nor enhanced the capacity to withstand infection by *P. infestans*.

These experimental data readily explain the frequent occurrence on rotting tubers of fungi giving negative results in pathogenicity tests on normal specimens. On the one hand, such manifestations may be the result of a complex of rots introduced by the late blight parasite, while on the other they may represent a condition arising only when the constitution of the tubers is modified by external factors in the direction of lessened resistance.

Beaumont (A.) & Large (E. C.). **Potato spraying in the south-west, 1942 and 1943.**—*J. Minist. Agric.*, li, 2, pp. 71–75, 1944.

The evidence obtained in demonstrations of spraying for the control of potato blight [*Phytophthora infestans*: *R.A.M.*, xxi, p. 345] in south-western England has shown clearly how erroneous is the view held by some growers that damage is only slight if the tubers do not suffer unduly. In 1942, most of the unsprayed potatoes were completely defoliated by the end of August, when tuber growth ceased. Two spray applications were made in the demonstration fields, at the beginning and end of July, the gain in yield from the spraying ranging from 2·5 to 5·2 tons per acre. In 1943, one of the worst years in living memory for blight, two sprays given in 14 centres on Majestic from 'A' certificate seed and from old, uncertified seed, resulted in a gain from spraying averaging 2 tons per acre for the former, as against only 0·8 for the latter.

So-called potato 'rust', usually associated with potash deficiency [ibid., xxii, p. 105], is often responsible for the apparent failure of spraying to increase yields. In two centres, the plants dried up owing to 'rust' before blight could make much difference. Also, apart from 'rust', the gain from spraying, like the total yield, was less on poorer than on better soils.

The use in 1942 of row-crop tractors on steeply sloping fields was a success. While the plants are only knee-high and still upright, the tractor outfit, with wheels adjusted to the width of the rows, causes practically no damage. For the second spraying, it was only occasionally necessary to use a horse. When the haulms are very heavy and sprawling, the sprayer wheels inflict a good deal of cutting, but it is better to sustain this loss than have all the haulms destroyed by blight. The sprayers apply 100 to 120 gals. per acre. A 500 gal. closed tank and a small rotary pump driven by a 1½ h.p. petrol engine were mounted with the sprayer, on a lorry. The tank was filled at a river and water transferred to the sprayer as required.

Analyses of sprayed leaves showed no cuprous oxide or other proprietary spray equal to Bordeaux mixture in its ability to resist washing-off by rain. Used at the rate of 120 gals. per acre, 1 per cent. Bordeaux mixture (12 lb. granulated copper sulphate, 15 lb. hydrated lime) costs 4*s*. 9*d*. per application per acre as against 8*s*. 6*d*. per application of 6 lb. per acre for cuprous oxide. Spraying contractors, using a proprietary material, generally charge about 25*s*. per acre for each application, the farmer providing the water.

SHERF (A. F.). **Infection experiments with Potato ring rot and the effect of soil temperature on the disease.**—*Amer. Potato J.*, xxi, 2, pp. 27–29, 1944.

Experiments carried out in a greenhouse in New Jersey during 1940–1 and 1941–2 on the effect of soil temperature on potato ring rot (*Phytomonas sepedonica*) [*Corynebacterium sepedonicum*: *R.A.M.*, xxiii, p. 148] showed that at soil temperatures of 14° and 18° C. there was 50 per cent. infection from seed piece inoculation with a contaminated knife, while only about 5 per cent. occurred at 22° to 30°. At 18° the time taken for the symptoms to develop averaged 63 days, at 14° 88 days. Nearly twice as many stolons and tubers were infected at 14° as at 18°.

Sprout inoculation by hypodermic injection averaged 73 per cent. infection with very little infection at 30°. Foliage symptoms usually developed in 44 to 60 days; they appeared more slowly at 14° than at the other temperatures. Maximum stolon and tuber infection occurred at 18° with progressively less at 22° and 26°, while none occurred in the one plant infected at 30° and very little at 14°.

At temperatures most favourable for potato growth, viz., 18° to 22°, about 25 to 30 days elapsed from the first appearance of the symptoms until the death of the plant.

Infected plants showing no leaf symptoms and with no bacteria in the aerial stems sometimes produced infected stolons and tubers. Plants with leaf symptoms and numerous bacteria in the stem showed no or few bacteria in the stolons and tubers. Most infected plants, however, had foliage symptoms and bacteria present in the stem. Occasionally, one stem showed severe symptoms and contained many bacteria, while another stem from the same seed piece remained healthy. Long stolons produced infected tubers less often than short ones. Tuber size was not correlated with percentage of tuber infection. The stem was the most reliable portion from which to obtain smears, which should be taken about 1 in. below the ground-line.

Inoculation with equal amounts of pure cultures of *Erwinia carotovora* and *C. sepedonicum* decreased the percentage of infection and increased the length of time required for symptom development, and gave a higher percentage of tuber infection with visible evidence of rot at the stem end of the tuber than did *C. sepedonicum* alone. However, soft rots of the pith of the tuber occurred in the absence of the

soft-rot organism and while the tuber was still attached to the plant, without any evident external symptoms in the tuber or stolon.

The ultra-violet light technique of Iverson and Kelly [ibid., xx, p. 549] when used by the author failed to detect some infected tubers. In laboratory tests, roccal (1 in 100) was an effective bactericide against the ring-rot organism. Some cultures of *C. sepedonicum* were still viable after 28 months on agar slants under mineral oil [ibid., xxii, p. 404].

THIRUMALACHAR (M. J.). **Ergot on Sugarcane in Mysore.**—*Curr. Sci.*, xii, 12, pp. 330–331, 1943.

Attention is drawn to the occurrence on sugar-cane arrows in Mysore of the elongated, yellowish-black sclerotia of ergot [? *Claviceps* sp.], hitherto recorded on this host only from the Philippines [*R.A.M.*, x, p. 440]. Arrowing sugar-cane varieties produce immense masses of flowers, and the author considers that this reaction opens an encouraging possibility for the large-scale production of ergot.

MERRILL (E. D.). **An index to Rafinesque's published technical names for the cellular cryptogams.**—*Farlowia*, i, 2, pp. 245–262, 1943.

In connexion with the author's recent discovery (*Proc. Amer. phil. Soc.*, lxxxvi, pp. 72–90, 1942) of the omission from standard botanical indexes of Rafinesque's validly published generic and specific names, a list is here given of those proposed by the latter or species belonging to 92 genera of fungi, 46 of which appear to have been generally overlooked by students of the cellular cryptogams since their appearance in 1834.

ROGERS (D. P.) & JACKSON (H. S.). **Notes on the synonymy of some North American Thelephoraceae and other resupinates.**—*Farlowia*, i, 2, pp. 263–328, 1943.

Among the cases of synonymy on North American Basidiomycetes (mainly Thelephoraceae) critically analysed by the writers in connexion with changes proposed in the nomenclature of this group during the last eight or ten years, the following may be mentioned. On the authority of Burt (*Ann. Mo. bot. Gdn.*, iv, p. 240, 1917), and of Bourdot and Galzin (Hyménomycètes de France, p. 358, 1928), *Coniophora puteana* is preferred as a designation for the cellar fungus of timber to *C. cerebella*.

A study of the type collection of *Corticium areolatum* Bres. revealed distinct differences between it and *C. apiculatum*, to which it was referred by Burt [*R.A.M.*, vi, p. 125], and the former species is consequently upheld as valid. *C. areolatum* Stahel is identical with *Pellicularia filamentosa* (Pat.) Rogers [*C. solani*: ibid., xxii, p. 372]. The comparative study of large numbers of specimens is necessary to settle the taxonomic position of the *C.* spp. sect. *P.* Bourd. & Galz. centring round *C. arachnoideum* sensu Bres. and *C. centrifugum* sensu Bres., and such relative finality has not yet been attained.

An index is appended, indicating the systematic position of the various genera and species by means of variations in the type.

BEETLE (A. A.). **Specific decapitalization.**—*Chron. bot.*, vii, 8, pp. 380–381, 1943.

A number of recent papers dealing with botanical nomenclature are cited in support of the movement for the decapitalization of specific epithets. An amendment in the existing International Rules of Botanical Nomenclature in this sense is urged.

RAY (W. W.). **Notes on Oklahoma Cercosporae—III.** *Mycologia*, xxxvi, 2, pp. 172–176, 1944.

This further list of *Cercospora* spp. from Oklahoma [*R.A.M.*, xxii, p. 79] includes

the following new species: *C. gomphrenae*, which forms circular, tan to dingy grey spots on leaves of *Gomphrena globosa*, 0·5 to 4 mm. in diameter, bordered by a wide red to purplish zone and produces unbranched conidiophores and hyaline conidia, 2 to 3·5 by 30 to 135 μ; *C. paspali* on leaves of *Paspalum stramineum*; and *C. staphyleae* on leaves of *Staphylea trifolia*.

KERN (F. D.) & THURSTON (H. W.). **Additions to the Uredinales of Venezuela—III.**—*Mycologia*, xxxvi, 1, pp. 54–64, 1944.

Another 25 species are added to the published lists of Venezuelan Uredinales [*R.A.M.*, xxiii, p. 42], bringing the total up to 263. A rust on maize, previously referred to *Puccinia pallescens*, is recognized as *Angiopsora A. zeae*, while *P.* [*A.*] *pallescens* is believed to be confined to *Tripsacum*. A new species, *Ravenelia mirandensis* is described on *Cassia tora*. The numerous spines on each teleutospore and the appressed cysts are stated to differentiate this species from the others known on *Cassia*, except *R. antiguana*, from which it differs in the lack of paraphyses, the smaller uredospores, and the smaller teleuto heads with fewer spores.

SINGER (R.). **Notes on taxonomy and nomenclature of the Polypores.**—*Mycologia*, xxxvi, 1, pp. 65–69, 1944.

This is a short extract of the classification of the Polyporaceae evolved in co-operation with A. A. Bondarzev, and submitted for publication in the Russian journal *Sovietskaya Botanika*, June, 1941, incorporating a few corrections since made.

GARCIA RADA (G.) & STEVENSON (J. A.). **La flora fungosa peruana. Lista preliminar de hongos que atacan a las plantas en el Peru.** [The Peruvian fungus flora. A preliminary list of fungi attacking plants in Peru.]—112 pp., Estac. exp. agríc., La Molina, 1942.

Many of the records in this list of parasitic fungi of Peru have already been noticed from other sources [*R.A.M.*, xi, p. 225; xix, p. 264, *et passim*], but reference may here be made to the following: *Synchytrium endobioticum* on potato [ibid., ix, p. 63] in the region of the Central Andes (Abancay, Matucana, San Mateo, and Ancash); *Urophlyctis alfalfae* on lucerne; *Bremia lactucae* on lettuce; *Phytophthora parasitica*, *P. citrophthora*, and *Phoma citricarpa* on citrus (the last-named specifically on sweet orange); *Dimerosporium heveae* and *Dothidella ulei* [ibid., v, p. 689; xxii, p. 495], agents of foliar diseases of *Hevea* rubber; a species of *Claviceps* (? *C. purpurea* or *C. microcephala*, with sclerotia 5 to 6 mm. in length [ibid., xvii, p. 269]) on *Poa candamaona*; *Elsinoe ampelina* on vine; *Melampsora lini* on flax (Departments of Lima Ica, Libertad, and Cajamarca); *Cercospora henningsii* producing large, chestnut-coloured spots on living cassava leaves [ibid., xxi, p. 242]; *C. musae* [*Mycosphaerella musicola*] on *Musa* sp.; *C. vaginae* and *Helminthosporium sacchari* (syn. *H. ocellum*) on sugar-cane; *Physalospora obtusa* and *Penicillium expansum* on apple; *Uromyces fabae* generally distributed on broad bean; *U. appendiculatus* and *Isariopsis griseola* on *Phaseolus vulgaris*; *Cerotelium fici* on fig (general); *Tilletia levis* [*T. foetida*] and *T. tritici* [*T. caries*] on wheat; *Corticium koleroga* on coffee; *H. oryzae* [*Ophiobolus miyabeanus*] on rice; *Nigrospora oryzae* on maize; *Stemphylium sarciniforme* on crimson clover (*Trifolium incarnatum*); *Fusarium bulbigenum* var. *lycopersici* on tomato; and *F. vasinfectum* on cotton. Exception is taken to Abbott's attribution of avocado scab to *Sporotrichum citri* [ibid., ix, p. 63]. There is, in fact, no certainty as to the occurrence of the causal organism, *Sphaceloma perseae*, in Peru.

A bibliography of 84 titles and fungus and host indexes are appended.

Fitzpatrick (H. M.). **A bibliographical study of the Icones Pictae Specierum Rariorum Fungorum of Christiaan Hendrik Persoon.** —*Mycologia*, xxxvi, 2, pp. 177–187, 4 figs., 1944.

Photographs of the title page, the fourth fascicle, and other parts of C. H. Persoon's 'Icones pictae specierum rariorum fungorum', which is stated to be a very rare book in North American libraries and often incomplete, have been prepared at Cornell University and sets of prints were offered to those wishing to complete their imperfect copies. The book is the companion volume to his 'Synopsis Methodica Fungorum'.

Costa (A. S.). **Multiplication of viruses in the Dodder, Cuscuta campestris.**—*Phytopathology*, xxxiv, 2, pp. 151–162, 1 fig., 1944.

An account is given of the results of experiments conducted at the Rockefeller Institute for Medical Research from January to June, 1943, to determine the part played by dodder (*Cuscuta campestris*) in the transmission of four viruses [*R.A.M.*, xxiii, p. 247], viz., tobacco mosaic, [tomato] aucuba mosaic, cucumber mosaic, and cranberry false blossom [ibid., xxiii, p. 263]. The two first-named viruses were transmitted from tomato to Bonny Best tomato and tobacco by this means in a few cases where the dodder was taken directly from diseased plants, the incubation period ranging from 12 to 20 days, but in no instance was transmission effected after viruliferous dodder had been grown once or twice on immune lucerne or crimson clover. No multiplication of these viruses takes place therefore in dodder, the juice of which exerts an inhibitory effect on them, gauged by the number of local lesions secured on *Nicotiana glutinosa*.

A high percentage of transmission through dodder was obtained with the cucumber mosaic virus on Turkish tobacco and *N. glutinosa*. Moreover, viruliferous dodder stems, grown four times successively on immune red clover (corresponding to a dilution beyond the dilution end point of the virus), showed no diminution of virus content. The incubation period ranged from 9 to 20 days (9 to 12 in the majority of the test plants). Local lesions developed in four to five days near the point of attachment on broad bean plants supporting dodder stems containing the cucumber mosaic virus, suggesting that the virus increases in dodder, becoming systemic, and is transferred at the time of haustoria formation. As in the case of tobacco and tomato aucuba mosaic, the juice of dodder also exerted an inhibitory action on cucumber mosaic, measured by its toxicity to Black cowpeas. Dodder stems were successfully inoculated by rubbing with the cucumber mosaic virus, which induced a varying degree of growth distortion.

Cranberry false blossom was retained in *C. campestris* after six consecutive transfers on lucerne, which Kunkel has shown (in unpublished work) to be immune from this virus.

Valleau (W. D.), Johnson (E. M.), & Diachun (S.). **Root infection of crop plants and weeds by Tobacco leaf spot bacteria.** —*Phytopathology*, xxxiv, 2, pp. 163–174, 3 figs., 1944.

In addition to information already presented from another source [*R.A.M.*, xxiii, p. 281], the following points are of interest in this expanded account of field observations in Kentucky on the persistence in the soil of the causal organisms of tobacco angular leaf spot and wildfire (*Bacterium angulatum* [*Pseudomonas angulata*] and *Bact.* [*P.*] *tabacum*). In a test involving the inoculation of tobacco leaves with ten composite samples of soil collected along a fence row 4 ft. distant from a bed heavily infested with *P. tabacum* in a field of which the remainder had been ploughed and prepared for a new tobacco crop, nine induced the development of 1 to 75 wildfire spots, two also caused angular leaf spot, and one the latter alone. Of ten similar samples collected from weedy spots in the ploughed field (which had

been in orchard grass [*Dactylis glomerata*]—Korean *Lespedeza* pasture for the past five years), two induced wildfire alone, five both diseases, and one angular leaf spot only. When the individual weeds were tested, *P. angulata* was obtained from roots of ragweed [*Ambrosia artemisiifolia*], giant ragweed [*A. trifida*], white clover, vermifuge [*Artemisia* (?) *absinthium*], and *Oxalis*, and *P. tabacum* from those of *Lespedeza*, shepherd's purse [*Capsella bursa-pastoris*], white clover, ragweed, chickweed [? *Cerastium arvensis*], and orchard grass. At this juncture, some growers were already beginning to set tobacco.

Wheat roots having previously been shown to harbour both species of bacteria, surface-sterilized seeds were germinated in a damp chamber, and the developing roots inoculated by immersion in an aqueous suspension of one or other of the pathogens containing 1,000,000 to 2,000,000 cells per c.c. The plants were then placed on sterile moist paper towelling in Petri dishes, and in two to five days bacterial colonies were detected, mostly in the root-hair region, on 85 out of 96 inoculated roots. All the 40 root systems used as inoculum produced typical wildfire spots on tobacco leaves. When individual colonies were removed on a short piece of wheat root inoculated with one of the bacteria, crushed in water, and inoculated into tobacco leaves, angular leaf spot or wildfire developed. There is little doubt, therefore, that the colonies observed on the wheat roots were those of *P. angulata* and *P. tabacum*.

Bullock (J. F.) & Moss (E. G.). **Strains of flue-cured Tobacco resistant to black shank.**—*Circ. U.S. Dep. Agric.* 682, 9 pp., 3 figs., 1943.

Descriptive notes are given on four second back-cross F_4 selections of tobaccos resistant to black shank (*Phytophthora parasitica* var. *nicotianae*) [*R.A.M.*, xi, p. 407], which have been developed at the North Carolina Agricultural Experiment Station by hybridization between No. 301 and other cigar-wrapper strains with flue-cured varieties, e.g., Virginia, White Stem Orinoco, and Warne, and are now ready for release to growers. The new strains are designated Black Shank Resistant VBL-Strain 1 (Oxford 1), Black Shank Resistant VBL-Strain 2 (Oxford 2), Black Shank Resistant WSO-Strain (Oxford 3), and Black Shank Resistant W-Strain (Oxford 4). Of these, the first is barely distinguishable from the flue-cured parent, Virginia Bright Leaf, the second is similar, the third closely resembles White Stem Orinoco, and the fourth approximates in its growth habits to Warne.

During 1941, black shank was found to be generally distributed in the six counties of North Carolina already infested in 1932, and had further spread to three others, representing a distance of 200 miles from the nearest previously recognized focus of infection. In the course of 1937, the pathogen was conveyed to three counties of Virginia from Pitt County, North Carolina.

Vaughan (E. K.). **The use of ethyl mercury phosphate for treating Tomato seed in New Jersey.**—*Phytopathology*, xxxiv, 2, pp. 175–184, 1944.

New improved ceresan (ethyl mercury phosphate), at the rate of 1 in 24,000 or in any case not exceeding 1 in 20,000, proved as effective as mercuric chloride in the control of seed-borne tomato diseases, notably early blight (*Alternaria solani*) in New Jersey [*R.A.M.*, xxiii, p. 46], the period of immersion required being five minutes if followed by 20 to 30 minutes' drainage of the sacks of seed before centrifuging, or ten minutes if the latter process is to take place immediately after disinfection. An added advantage of ethyl mercury phosphate over mercuric chloride lies in the safety with which a residue of the former compound may be left on the seed coat, thereby helping to prevent recontamination of the seed and affording some protection against seedling damping-off. Ethyl mercury phosphate solutions lose some of their efficacy with repeated use [ibid., xxiii, p. 264], and should be discarded after one treatment. The fungicidal solution may be applied

with satisfactory results at a temperature range of 43° to 80° F., and may be made up either with tap or stream water. The seed may be treated either when freshly extracted or after drying, and stored from one season to the next in an appropriate container.

Other seed-borne pathogens of less importance locally than *A. solani* are *Phytomonas* [*Xanthomonas*] *vesicatoria*, *P.* [*Corynebacterium*] *michiganense*, and *Septoria lycopersici*.

REICHERT (I.), PALTI (J.), & MINZ (G.). **Field trials for the control of Tomato leaf diseases.**—*Hassadeh*, xxiii, 2–8, 12 pp., [? 1943. Hebrew.]

A detailed, fully tabulated account is given of five spraying trials for the control of tomato diseases carried out in co-operation with B. Capuler and S. Stoller from 1939 to 1942 in Palestine in the warm, humid coastal plain (near Tel Aviv), in the hot, moderately humid Jordan Valley (at Degania), and in the warm, rather dry eastern part of the Valley of Esdraelon (Tel Aïnal). The most important of these diseases in Palestine are powdery mildew (*Oidiopsis taurica*) [*R.A.M.*, xvii, pp. 15, 217], leaf mould (*Cladosporium fulvum*), early blight (*Alternaria solani*), and leaf spot (*Septoria lycopersici*). Powdery mildew and early blight occur in all parts of the country in all seasons, while leaf mould attacks mainly autumn-grown tomatoes in the coastal plain and winter or spring crops in the Jordan Valley and the Valley of Esdraelon. During the trials, *S. lycopersici* made no appearance, and *A. solani* was only of quite secondary importance. Powdery mildew, however, caused strong infection in the Jordan Valley trial in 1941, and leaf mould severely attacked the tomatoes in the three trials conducted in the coastal plain.

The data obtained showed that spraying with the lime-sulphur preparations cita and sulfinette at a 1·5 per cent. concentration gave very effective control of powdery mildew, but copper sprays were only slightly effective against this disease. Excellent control of leaf mould was given by these same lime-sulphur washes, and also by sulfocide and shirlan AG (both at 0·5 per cent.), Bordeaux mixture (1 per cent.), and perenox (0·33 or 0·5 per cent.).

The powdery mildew control given by sulfinette in the trial in the Jordan Valley increased the yields by 50 per cent. (2,830 to 4,250 kg. per dunam = 1,000 sq. m.). The combined control of powdery mildew and leaf mould in the 1941 trial in the coastal plain given by cita lime-sulphur, sulfinette, and perenox with the addition of 1 per cent. white oil resulted in a very largely increased yield, though Bordeaux mixture and perenox without oil failed to give any conspicuous increase. The evidence suggests that Bordeaux mixture (1 per cent.) and perenox (0·33 per cent.) may injure tomato plants if applied at frequent intervals. They require to be tested at lower concentrations.

The observations made in the Jordan Valley in 1941 indicate that powdery mildew may be controlled there by lime-sulphur applications at about weekly intervals, even if spraying is delayed until after the first symptoms have appeared. The trials in the coastal plain demonstrated that leaf mould cannot be controlled by spraying at intervals of three weeks; spraying at intervals of four to five days gave effective control, however, and the choice of suitable intervals appears to be more important than that of a fungicide. In the Jordan Valley, the extra profit obtained by spraying makes frequent applications worth while. In the coastal plain, whether spraying is worth while or not depends on current market prices.

JENKINS (C. F. H.). **Thrips and their relation to spotted wilt and other plant injury.** *J. Dep. Agric. W. Aust.*, Ser. 2, xx, 4, pp. 272–275, 2 figs., 1943.

This paper discusses the part played by thrips in the spread of tomato spotted wilt [*R.A.M.*, xxii, p. 502], the most important disease of the crop in Western

Australia. Various formulae for baits, dusts, and sprays for controlling thrips are given [ibid., xxii, p. 115].

Dodge (B. O.). **Boxwood blights and Hyponectria buxi.**—*Mycologia*, xxxvi, 2, pp. 215–222, 2 figs., 1944.

Volutella [*Chaetodochium*] *buxi* and *Verticillium buxi* [*R.A.M.*, xx, p. 434], associated with the destructive leaf blight or die-back disease of boxwood [*Buxus sempervirens*], were assumed, in a previous study made in co-operation with Marjorie E. Swift [ibid., x, p. 34], to be simply different types of fructification of the same fungus. Later, however, doubts arose as to the correctness of that view. Unfortunately the perfect or ascocarpic stage, *Nectriella rousseliana* (Mont.) Sacc. (this name, and not *Nectria rouselliana*, is stated to be the correct one in accordance with modern usage), has never been found in nature. On a later occasion, box leaves infected by *Hyponectria buxi* were found to bear also the white growth of *V. buxi* and sporodochia of *C. buxi*. It is doubtful whether the three forms of fructification are stages of the same fungus, or whether there are two types of leaf blight or die-back, one caused by *H. buxi*, and the other by *Nectriella rousseliana*, both having similar conidial stages. It is suggested that studies of single-spore cultures of both *N. rousseliana* and *H. buxi*, followed by infection experiments, are necessary before the status of *C. buxi* and *V. buxi* can be determined.

Clapper (R. B.). **New Chestnuts for our forests?**—*Amer. Forests*, xlix, 7, pp. 331–333, 365, 7 figs., 1943.

Details are given of the hybridization experiments now being conducted by forest pathologists of the United States Bureau of Plant Industry at Glenn Dale, Maryland, with a view to the development of chestnuts resistant to blight [*Endothia parasitica*: *R.A.M.*, xxiii, p. 282] by crossing the native American *Castanea dentata* with Asiatic species, e.g., the Chinese *C. mollissima* and the Japanese *C. crenata*. Attempts are also in progress to breed blight-resistant chestnut-chinquapin hybrids to replace the susceptible native chinquapins of the Southern States and the Ozark Mountains of Arkansas as sources of food for animals. Three species appear to be specially promising for this purpose, namely, *C. seguinii*, *C. alnifolia*, and *C. paucispina* (possibly a variety of *alnifolia*).

Banerjee (S. N.) & Bakshi (B. K.). **Trametes floccosus Bres. in culture.**—*Sci. & Cult.*, ix, 8, pp. 352–353, 1 fig., 1944.

In July, 1942, fresh sporophores of *Trametes floccosus* were collected in large numbers from living and dead trunks of *Ficus religiosa* [one of the trees on which the lac insect is reared] at Calcutta and grown in pure culture on potato dextrose agar by C[lara] W. Fritz's method [*R.A.M.*, ix, p. 754]. In 30-day-old cultures the felty mat was predominantly white, but towards the upper advancing zone, patches of pale yellow-orange (Ridgway), and pale ochraceous-salmon appeared. Resupinate, pale buff fruit bodies with minute pore mouths were gradually formed and found on sectioning to contain numerous basidia with narrow elliptical, hyaline, smooth-walled basidiospores, 12 to 14 by 6μ, and a few cystidia. Spore deposits from one of these fruit bodies gave rise to new polysporous cultures, three of which also fructified in about a month. Inoculation experiments with the fungus on healthy wood blocks of *F. religiosa* are in progress.

Hirt (R. R.). **Distribution of blister-rust cankers on Eastern White Pine according to age of needle-bearing wood at time of infection.**—*J. For.*, xlii, 1, pp. 9–14, 1944.

A study of blister rust (*Cronartium ribicola*) infection of eastern white pine (*Pinus strobus*) under natural outdoor conditions at the New York State College of Forestry

from 1927 to 1938 showed that cankers developed on current-season and one- and two-year-old needle-bearing wood, the majority on one-year-old bark [cf. *R.A.M.*, xvi, p. 287; xix, p. 375]. These observations apply to three- to six-year-old trees potted the same season as needle infection occurred, to undisturbed natural reproduction three to seven years old, and also to seven other species of five-needled potted white pines, viz., *P. flexilis* and its var. *reflexa*, *P. monticola*, *P. aristata*, *P. peuce*, *P. koraiensis*, and *P. parviflora*.

Cankers on needle-bearing wood that was two years old at the time of exposure to infection were the first to appear on the bark. By the autumn of the following year these cankers had attained the size and aspect typical of those on current-season and one-year-old wood about $1\frac{3}{4}$ years after needle infection. When current-season needles contracted infection in July or August, most of the resultant cankers were visible in the autumn of the next year, but if infection was not established until September, the majority appeared only in the second spring, i.e., 20 to 22 months after the pathogen entered the host. The bulk of the cankers ensuing on infection of the one-year-old needles from July to September could be detected in the autumn of the next year, at which time just under 50 per cent. of those induced by the infection of current-season needles were discernible.

It is evident from these data that the use of sample white pine plots affords a means of close approximation of the relative amount of infection for any season by the autumn of the next year, while accurate conclusions can be reached by the following spring. The fact that the majority of cankers are formed on one year-old wood is important in studies of the history of the rust in infection centres. Years of heavy infection may be determined by ascertaining the age of the nodal and internodal bark bearing the maximum number of similar-aged cankers, epidemics in all probability dating from the years following those in which the diseased bark was formed. In this connexion, the tendency of abnormal weather conditions or unfavourable sites to cause premature shedding of old needles and the cessation of growth in young ones before the attainment of average length must be borne in mind as a factor affecting the canker pattern.

Hepting (G. H.) & Downs (A. A.). **Root and butt rot in planted White Pine at Biltmore, North Carolina.** *J. For.*, xlii, 2, pp. 119–123, 1 fig., 1944.

Root and butt rots were observed on 75 per cent. of the 40- to 45 year old white pine (*Pinus strobus*) in plots thinned for the fifth time in 1942 on the Biltmore Estate, North Carolina, the corresponding percentages for the trees in the thinned isolation strips, 33 ft. wide, surrounding these plots and in unthinned plots being 53 and 4, respectively. *Fomes annosus* was the principal agent of rotting, causing 29, 14, and 2 per cent., respectively, of the infections in the three above-mentioned areas, while *Polyporus circinatus* and *P. schweinitzii* were responsible for a small amount. The pathogens gained ingress through roots that had died as a result of strangling or other causes, probably associated with careless planting leading to a poor arrangement of the systems. The higher proportion of butt rot in thinned stands may be due to a build-up of *F. annosus* in the stumps of previous thinnings.

Lynch (D. W.), Davis (W. C.), Roof (L. R.), & Korstian (C. R.). **Influence of nursery fungicide-fertilizer treatments on survival and growth in a southern Pine plantation.**—*J. For.*, xli, 6, pp. 411–413, 1943.

Certain chemical treatments used for the control of damping-off in seed-beds were found to exert a detrimental effect on the survival of certain species of pine in the Soil Conservation Service nursery, Chapel Hill, North Carolina. In the case of loblolly pine [*Pinus taeda*], phosphoric acid appeared to be responsible for the trouble, while shortleaf [*P. echinata*] was injured by a high concentration of either or both phosphoric acid and ferrous sulphate.

Da Rocha Azevedo (P.). **Influence of the phenols of creosote on the preservation of wood.**—*An. Ass. quím. Brasil*, ii, pp. 97–108, 1943. [Portuguese. Abs. in *Chem. Abstr.*, xxxviii, 5, p. 1087, 1944.]

Test pieces of Paraná pine (*Araucaria angustifolia*) were treated with (1) commercial creosote containing 6 per cent. phenol; (2) the same after distilling off substances boiling below 250° [C.]; (3) gas oil to which enough of the creosote distillate was added to give it a phenol concentration of 8 per cent.; and (4) gas oil, and exposed under humid conditions to the action of *Lenzites*, *Fomes*, and *Polyporus* spp. Treatments (1) and (2) afforded equally efficient protection, while (3) and (4) were unsatisfactory. It is concluded that the fungicidal effect of creosote does not reside in its tar acid content.

Ulbrich (E.). **Hausschwamm, Nassfäulen (Trockenfäulen) und andere Zerstörer unserer Häuser und Bauten. Ratgeber zur Verhütung von Pilzschäden.** [Dry rot, wet rots (dry rots), and other destroyers of our houses and buildings. A guide to the prevention of fungal damage.]—88 pp., Berlin, P. Parey, 1941. RM.2. [Abs. in *Zbl. Bakt.*, Abt. 2, cvi, 11–12, p. 209, 1944.]

This publication, the first to be issued by the Mycological Department of the Botanical Museum, University of Berlin, is stated to cover in a concise and popular form, without neglecting the mycological aspects of the subject, a variety of problems connected with timber preservation against dry rot (*Merulius* [*lacrymans*] and other *M.* spp.), *Coniophora* and *Coniophorella* spp., *Poria* spp., and other wood-destroying fungi. Other sections deal with the 'blueing' of wood by Ascomycetes [including *Ceratostomella* spp.], moulds on food, household utensils, and the like, and the control of the various forms of damage.

Muntz (H. H.). **A fence post service test in the Mississippi Delta.**—*J. For.*, xli, 7, pp. 524–526, 1943.

This is a progress report on the condition in November, 1941, of 454 untreated fence posts of untreated osage orange [*Toxylon pomiferum*], black locust [*Robinia pseud-acacia*], bald cypress [*Taxodium distichum*], overcup oak [*Quercus lyrata*], honey locust [*Gleditschia triacanthos*], and red mulberry [*Morus rubra*] placed in position in the Delta Experimental Forest near Stoneville, Mississippi, in February, 1937. Osage orange was the most durable of the species examined, with all the posts still serviceable at the end of the interim period, followed in descending order by hill-grown black locust, red mulberry, Delta-grown black locust, bald cypress, honey locust, and overcup oak with 91, 89, 73, 44, 25, and 23 per cent., respectively, in a sound state. None of the creosoted posts set in the ground at the same time showed any sign of deterioration.

Romney (V. E.). **The Beet leafhopper and its control on Beets grown for seed in Arizona and New Mexico.**—*Tech. Bull. U.S. Dep. Agric.* 855, 24 pp., 8 figs., 1 map, 1943.

Beets grown for seed in the Salt River and Safford Valleys of Arizona and in Mesilla Valley, New Mexico, are subject to autumn infestations of the leafhopper, *Eutettix tenellus*, the vector of the beet curly-top virus [*R.A.M.*, xxiii, p. 159]. The insects originate principally in the adjoining semi-desert areas, where summer rains induce the germination of plants serving as hosts from July to September or later.

The variety of beet, the density of the stands, the rate at which the soil becomes covered by the foliage, and the degree of shading are important factors in determining the number of leafhoppers a planting can tolerate without sustaining appreciable injury from curly top. Observations on non-resistant varieties indicate that in Arizona, with 700 to 1,000 plants per 100 ft. of row, 125 to 150 leafhoppers per 100 ft. are necessary to inflict significant damage, such stands being able to tolerate

some 20 per cent. infection by curly top. On the other hand, an infestation of only 75 to 100 insects per 100 ft. in stands of 600 to 800 plants per 100 ft. has caused sufficient damage in New Mexico to justify insecticidal measures. In both districts a reduction in seed yield may be caused by fewer leafhoppers in thin stands than are required to induce comparable results in dense plantings. Plants sustaining severe curly-top infection by late April usually yield no seed, while the amount produced by those more mildly affected is substantially below normal. The viability of the seed from curly-top beets does not seem to be materially impaired.

Experiments covering the six-year period 1935–41 showed that important reductions in the incidence of curly top (34·2 per cent. in 1937–8, with an average seed increase of 359 lb. per acre) resulted from the control of the vector by autumn spraying with pyrethrum-in-oil at the rate of 6 to 9 gals. per acre.

Both in Arizona and New Mexico, the infestations of *E. tenellus* tend to be more injurious in or after late October. Beets planted from mid-August to early September can usually be made to cover the soil surface with foliage in about 50 days, and fields with over 95 per cent. of the ground thus covered have been found to afford unfavourable conditions for the leafhopper. The attainment of this stage by or before late October is therefore highly desirable.

Taylor (G. G.) & Li (L. Y.). **Ring-spot: a fungus disease of winter Lettuce.**—*N.Z.J. Agric.*, lxviii, 3, pp. 193–194, 1 fig., 1944.

Lettuce ring spot (*Marssonina panattoniana*) [*R.A.M.*, xviii, p. 569; xx, pp. 102, 191] was recorded in New Zealand in 1942. It was first identified from specimens received from Wanganui in 1939, and though not reported before, it had probably been present, though unrecognized. Incidence has increased recently, and heavy losses have been incurred in some of the older market-gardens, where lettuces are grown in close rotation. The disease is found in all the chief vegetable-growing areas, and is confined to winter lettuces. It first appears in June, becomes progressively worse up to the end of September, and then gradually dies down as warmer and drier conditions develop. Observations showed that in some Auckland crops, at least 50 per cent. of the seedlings set out in the field failed, as a result of attack, to produce marketable heads. Lettuces showing slight late infection are marketable, but rapidly deteriorate when crated, and are unsuitable for shipment.

Field evidence obtained locally suggests that the disease can be carried on the seed, as seedlings in new soil not before used for growing vegetables have become infected. That it is carried over in the soil was indicated in experiments in which healthy seedlings planted in infected soil of the previous winter showed up to 30 per cent. infection, though in these tests seedlings in soil not previously planted to lettuces remained unaffected.

In spraying tests, seedling-bed plants were given two applications of Bordeaux mixture (3–4–50), followed, in the field, by two or three sprays with cuprox (5 lb. per 100 gals.). Taking the results of six tests together, the treated plants showed 8 per cent. infection, as against 30 per cent. for the untreated. All the sprayed lettuces were saleable, but most of the unsprayed infected ones were not. In another trial, plants were taken from an unsprayed seedling-bed in which infection was present and were planted in the field. Three applications of spray were then made to half the plants. Heavy rain fell, and all the plants became infected, but the sprayed lettuces had 33 per cent. saleable plants, as against only 13 per cent. for the unsprayed.

It is recommended that spraying should be started before the disease appears in the seedling-beds. The first treatment should be applied soon after germination, and spraying should be repeated every two to three weeks in the seedling beds and every three to four weeks in the field. It is probably safe to use Bordeaux mixture throughout. A 12-months' rotation would probably be helpful. Particular care

should be taken to locate seedling-beds on soil that has not grown lettuces for at least 12 months. Half the present seeding rate would also be an improvement. Raised beds would be an advantage, especially for the later plantings. When the disease appears in the seedling-beds, the plants in the infected area should be dug out and destroyed, together with the surrounding, apparently healthy plants.

NEWHALL (A. G.). **A serious storage rot of Celery caused by the fungus Ansatospora macrospora n.gen.**—*Phytopathology*, xxxiv, 1, pp. 92-105, 3 figs., 1944.

'Black crown rot' is the name proposed for a serious storage disease of the butt ends of celery, responsible for heavy losses in western New York State and Ontario, Canada. None of the standard varieties grown for two years on muckland farms, where the trouble was prevalent, proved to be immune, though Easy Bleaching and Tall Golden Self Blanching were comparatively resistant in both seasons, while Pascal and Golden Plume were among the most severely attacked. In the first test, comprising 11 varieties, 15 to 50 per cent. of the total of 1,393 plants contracted infection in ten weeks of storage, while in the second, 9 to 65 per cent. of the plants of 15 varieties developed the rot within 11 weeks.

The first sign of infection, usually appearing seven to eight weeks after the plants have been placed in cold storage, i.e., between 25th November and 31st December, is the development of a pale ochraceous-tawny (Ridgway) lesion, 5 mm. in depth, on the butt end. With the advance of decay into the butt, the internal mycelium of the pathogen becomes strongly torose and very dark, imparting a dark olivaceous, later greenish slate-black tinge to the lesion. At a later date, the characteristic dark spots may be observed at almost any point on the outer leaf stalks, denoting inoculation through wounds. The lesions may produce conidia at room temperatures under humid conditions. The tissues near the outer edge of rapidly advancing lesions may acquire a distinct red shade.

Celery butts were successfully inoculated with pure cultures of the black crown rot fungus from tissue plantings, reisolation being effected from the lesions thus induced. Monospore cultures obtained both from naturally infected plants and from agar cultures were pathogenic to celery stalks in cold storage, seedlings grown under sterile conditions on agar, and leaves, the latter developing spots similar to those of early blight (*Cercospora apii*), on the lower surface of which sporulation occurs in a damp atmosphere.

The mycelium of the black crown rot fungus may entirely cover a 3 in. Petri dish in eight days at 18° C. on maize meal agar, indicating a growth rate three or four times in excess of those of *Phoma apicola* or *C. apii*. The colour at three to five days varies between red, brown, and bluish-green. The cell walls thicken and the mycelium becomes torose, the individual cells being ovate to spherical, and very dark olivaceous-brown to dark bluish or olivaceous-green, and attaining a diameter of 15 to 20 or up to 30μ.

Conidia were produced in profusion by the agar inversion technique of Miss Westerdijk and Van Luijk [*R.A.M.*, iv, p. 312]. These spores which are borne singly or in groups of several on hyaline to subhyaline, uni- to tricellular conidiophores, arising singly or in clumps from the mycelium, are falcate, hyaline to subhyaline, 120 to 210 by 6 to 11 (mean 160 by 8·8)μ, nearly half the spore consisting of a tapering, whip-like beak, while a sword-shaped appendage, 90 by 2μ, protrudes from the side of the basal cell at an obtuse angle in most of the conidia. This is one of the characters differentiating the celery fungus under discussion from *C. apii*, others being the obclavate rather than acicular shape of the conidia of the former and their much greater width (twice that of the early blight pathogen). Germination may be effected from any of the cells of the black crown rot fungus, including the beak and the tip of the appendage.

The celery fungus appears to be identical with the agent of pansy (*Viola tricolor*) leaf spot described by Osterwalder from Switzerland as *C. macrospora* [ibid., iv, p. 288]. A similar leaf spot of *V. tricolor* occurs in Alaska and California, and a culture from the latter habitat proved to be identical with the celery pathogen. The parasite of caraway (*Carum carvi*) designated *Cercospora cari* by Miss Westerdijk and Van Luijk [ibid., xx, p. 191] was likewise found to be the same as *C. macrospora* and the black crown rot fungus. The latter was experimentally shown to be capable of infecting caraway and *V. tricolor*, while conversely, the Californian strain of the pansy leaf spot attacked celery. If the celery pathogen were to be retained in *Cercospora*, the name *C. macrospora* Osterw. would stand, but in a proposed monograph of the genus by C. Chupp, no place is provided for any forms having conidia with appendages. At his suggestion, therefore, the name *Ansatospora*, based on the Latin word for a handle, *ansata*, is assigned to fungi of the *Cercospora* or *Cercosporella* type the conidia of which are furnished with one or more appendages, cilia, or secondary conidia, with *A. macrospora* (Osterw.) Newhall (syn. *C. macrospora* and *C. cari*) as the type species. A technical description is given [in English only].

Inoculation experiments with *A. macrospora* on potted caraway and parsley plants resulted in small lesions on the petioles, the leaves of *V. tricolor* being similarly affected. In comparative tests with the celery black crown rot fungus and *C. apii* on apples and carrots only the former proved to be pathogenic. Recent unpublished work by Tompkins and Hansen in California confirmed the author's suspicion that many other plants serve as hosts of *A. macrospora*.

The minimum, optimum, and maximum temperatures for the growth of the celery pathogen in culture was found to be near 0°, 17°, and 31° C., respectively, and the hydrogen-ion tolerance ranged from P_H 3·35 to 7·32, with the optimum near neutrality. Circumstantial evidence was obtained of the persistence of black crown rot in the soil, and in some fields a three-year crop rotation failed to eliminate it. The results of experiments on the control of the disease by the immersion of the butt ends of freshly harvested plants in various fungicides were not encouraging, and treatment along these lines is not advocated. Since infection rarely develops until the plants have been in storage for at least seven weeks, some growers have successfully reduced the loss from *A. macrospora* by reserving suspected fields for the early crop, which is never stored. Any plants from infested locations should be carefully watched after eight to nine weeks in storage, and in case of the appearance of black crown rot should be promptly marketed to obviate loss.

Padwick (G. W.) & Bhagwagar (P. R.). **Wilt of Gram in relation to date of sowing.**—*Indian J. agric. Sci.*, xiii, 3, pp. 289–290, 1 pl., 1943.

In experiments at the Imperial Agricultural Research Institute farm, Delhi, covering four seasons (1938 to 1942), gram (*Cicer arietinum*) was sown at weekly intervals from 23rd September to 28th October. The incidence of wilt [*Fusarium orthoceras* var. *ciceri*] decreased, with a corresponding increase in the grain yield, with delayed sowing [*R.A.M.*, xxii, p. 196] up to at least mid-October, after which date the harvests tended to decline. To cite some data, in 1938–9, the percentage of wilt sank from 11·5 per cent. in the 30th September sowing to 1·8 in that of 14th October, the yields for the two dates being 814 and 1,354 lb. per acre, respectively. In 1939–40 and 1940–1, the maximum yields were produced by sowings of 21st and 14th October, respectively (1,652 and 1,304 lb.), the percentage of wilt falling in the latter year from 20 in the first to 3·5 in the fourth sowing. In 1941–2 the crop was destroyed by hail, but the amount of wilt sank from 64·5 per cent. in the 30th September sowing to 10·8 and 5·0 respectively, in the plots sown on the last two dates in October.

Fischer (R.). **Zur Frage der 'Markkrankheit' (Markfäule) der Weinrebe.** [A contribution to the question of the 'pith disease' (pith rot) of the Vine.]—*Arb. biol. Anst.* (*Reichsanst.*), *Berl.*, xxiii, 4, pp. 429–456, 2 pl., 1943.

In this study the writer seeks to elucidate the causes of the so-called 'pith disease' of vines, which is very widespread in Austria, where it has been the object of exhaustive investigation, notably by Zweigelt and Voboril [*R.A.M.*, xvii, p. 499].

The symptoms of the disease, both as observed by the author and described by the Austrian workers on the one hand, and by Viala and Marsais from France on the other [ibid., xiii, p. 680], leave no doubt as to the identity of 'pith disease' and 'parasitic court-noué', alleged by the French scientists to be due to *Pumilus medullae*. The viticultural districts chiefly affected in Austria are those of Retz-Zellerndorf, Langenlois Lengenfeld Strass, Wolkersdorf Mitzelbach Matzen, and the Wachau, though no part of the country is entirely free from the trouble. Pith rot is found almost exclusively on grafts, mostly in the two- to six-year-old age group, the average loss from this source in the first year after planting amounting to 20 per cent. The Green Veltlin (highly esteemed for the excellent flavour of its wine) and Welschriesling varieties are particularly susceptible to pith disease, the latter more especially in Styria, where sporadic outbreaks are apt to occur locally. Other varieties affected to a lesser extent include the red, brown, and red-white Veltlins, Sylvaner, Gutedel, Neuburger, and the blue and grey Portuguese, *Riparia* being in general the most susceptible of the various stocks used for grafting.

From 35 diseased vines, mostly of the Green Veltlin and Welschriesling varieties grafted on *Riparia* or Kober 5 BB, the writer isolated on Pichler's agar medium (*Denkschr. Akad. Wiss. Wien* 95, 1918), adjusted to P_H 5·5 by the addition of malic acid, species of *Phoma* (20 isolations), *Oospora* (15), *Ceratostoma* (10), *Torula* (3), *Botrytis cinerea* and *Fusarium* (?) *viticola* [*F.* (?) *avenaceum*] (2 each), *Pestalotia affinis*, *Stysanus stemonites*, *Macrosporium commune* [*Pleospora herbarum*], and *Chlorosplenium* (1 each), and miscellaneous fungi (3). The predominant *Phoma* sp., representing 59 per cent. of the isolations, is characterized by coarse hyphae, up to 6μ in diameter, dark brown to nearly black at maturity, often coalescing into Viala's 'mycelial rods', 150μ in diameter; oval, often tightly compressed, applanate pycnidia, with an amber-yellow, later brown, fragile peridium; unicellular, hyaline, ovate to elongated, mostly straight, occasionally somewhat curved spores, 3 to 5 by 1·5 to 2·5μ, borne on conidiophores 10μ in length and of almost the same width as the spores; and other features typical of *Pumilus medullae*, with which the Austrian vine isolate is considered to be identical. The latter was also present in the pith of a number of healthy vines examined. The *Oospora* sp. produces a snow- to creamy-white, later reddish-brown mycelium, composed of septate, cylindrical, hyaline hyphae, 1 to 3 or up to 5μ in diameter, and spherical to oval, pale amber-yellow, thick-walled gemmae, 8 to 14μ in diameter, with a densely granular content, arising at many points along the hyphae or borne terminally in chains. The slow-growing *Ceratostoma* sp. is characterized by a brownish-grey, later clay-yellow, evanescent mycelium. Zweigelt's 'M' and 'N' fungi are tentatively identified with the author's *Oospora* and *Ceratostoma*, respectively.

The results of inoculation experiments with the three principal pith fungi (*Phoma*, *O.*, and *C.* spp.) are fully described and tabulated. They failed to establish the pathogenicity of the organisms, and the conclusion reached through intensive anatomical studies of the grafts (Welschriesling scions on *R. portalis* stocks, both of varying degrees of maturity) was that the trouble originates in the insufficient ripeness of both components and is at most accelerated by the presence of the pith fungi, notably under adverse soil, climatic, and meteorological conditions. The ill effects of the immature scion are mostly noticeable in the nursery, while those of the inadequately ripened stock only become apparent in the progressive deterioration of the grafts after transplanting.

It is evident from these data that the French workers' conclusions as to the parasitic nature of the form of court-noué under discussion cannot be upheld. The epidemic character of recent outbreaks is attributed to the abnormally changeable weather of recent years, coupled with the use of inferior grafting material, and need lead to no anxiety as regards a possible spread of infection.

WILLIAMS (R. O.). **Trinidad and Tobago. Administration Report of the Director of Agriculture for the year 1942.**—16 pp., 1943.

In this report [cf. *R.A.M.*, xxi, p. 10] it is stated (on pp. 4, 12, 14) that in Tobago cacao witches' broom [*Marasmius perniciosus*: ibid., xxiii, p. 169] is still not severe, and control measures are being maintained. On the Marper Estate some of the clones were still free and cropping well, while many sustained a light attack. The local trees selected for resistance, growing as budded clones and seedling blocks, reached a stage at which two were selected for the final trials. No infection was found during an inspection of the north coast of Tobago.

Bacterial wilt [*Xanthomonas solanacearum*] continues to be a limiting factor in tomato production [ibid., xix, p. 171], at least during the wetter months. Bacterial rot of cauliflower and cabbage [? *X. campestris*] was severe in some localities during the rains. In at least two widely separated localities carrots were affected by a severe leaf-spotting associated with *Macrosporium carotae*. The disease was stated to have been controlled by two applications of Bordeaux mixture made at an interval of 10 days.

Divisions of Plant Pathology and Seed Investigations. *Rep. N.Y. St. agric. Exp. Sta., 1942–3*, pp. 34–43, 53–58, 1944.

In this report [cf. *R.A.M.*, xxii, p. 289] fermate 1½–100 is recommended for the control of apple scab [*Venturia inaequalis*]. To avoid residue, it should be used at ½ or ¾–100 with ¼ pint B1956 spreader if applied with summer oil and black leaf 155. Fermate ¼ to ½–100 is more effective than wettable sulphurs against the cedar rust fungi [*Gymnosporangium juniperi virginianae* and *G.* spp.]. The combination of micronized sulphur 3–100 and fermate ½–100 gave excellent results in orchard practice where both scab and cedar rust were a problem. Evidence showed that sulphur sprays used against fruit diseases must, unless applied very thoroughly and shortly before rain, contain 4 to 5 lb. actual sulphur per 100 gals.

In an isolated apple orchard where elgetol ½–100 had been applied to the trees and the ground at the green-tip stage, spraying against *V. inaequalis* did not become necessary until after blossoming. Lead arsenate alone was used in the calyx and 10-day sprays against insects, and wettable sulphur was applied in the cover sprays to control secondary infection. McIntosh apples from this block were 96 per cent. free from scab at harvest, whereas in another orchard with a heavy carry-over of the fungus the fruit was less than 80 per cent. clean, though given three early sulphur sprays in addition to the cover applications.

Experimental data showed that in most seasons Bordeaux mixture (2–2–100) will control vine black rot [*Guignardia bidwellii*: cf. ibid., xxi, p. 348] and powdery mildew [*Uncinula necator*] and a concentration of 3–3–100 downy mildew [*Plasmopara viticola*]. A schedule of three applications of 4–4–100 is probably reliable for black rot and downy mildew, while two or three at 2–4–100 will control powdery mildew. Fermate (2–100) gives commercial control of downy mildew, but does not control powdery mildew satisfactorily.

Leaf spot of currants and gooseberries [*Pseudopeziza ribis* and *Mycosphaerella grossulariae*: ibid., xxii, p. 290] was controlled by two applications of Bordeaux mixture at 3–3–100 for currants and 3–5–100 for gooseberries. Lime-sulphur (1–50) did not give control. Gooseberry powdery mildew [*Sphaerotheca mors-uvae*:

loc. cit.] was controlled by one application of lime-sulphur (1–50) immediately after bloom.

For the third season in succession, spergon gave outstanding results as a pea seed protectant [ibid., xxii, pp. 290, 338], increasing yields by 100 to 900 lb. per acre in commercial fields. Arasan (1 oz. per bush.) and fermate-graphite (2·5 and 1·25 oz. per bush.) were almost as effective.

Outstanding results in the treatment of spinach seed (in the absence of red copper oxide) were secured with arasan 1 per cent., fermate 1·5 per cent., spergon 1·5 per cent., yellow cuprocide 0·5 to 0·75 per cent., and copper oxychloride-sulphate 1 per cent. The substitution of yellow cuprocide and copper oxychloride-sulphate [for red copper oxide] would effect a saving of 40 to 50 per cent. in copper without danger to the crop. In a fertile muck field where untreated seed produced a crop of 10 tons per acre, various treated lots yielded 16 to 22 tons per acre. An investment of 25 cents an acre for chemicals thus produced a return of $150 to $295 per acre.

During 1942 the severity of seed decay in Henderson Bush Lima beans [*Phaseolus lunatus*] was largely determined by soil temperature conditions. In cool, wet soils, untreated seed produced only 3 per cent. of a stand in early plantings, whereas in progressively later plantings the same stock gave 27, 52, and 86 per cent. of a stand. Seed treatments prevented much of the loss in the early plantings. Spergon (3 and 1·5 oz. per bush.), fermate (2 oz.), and arasan (1 oz.) were highly effective, ranking in the order given. In tests in commercial fields yields were increased by 100 to 1,000 lb. of shelled beans per acre. For an outlay of 10 cents per acre on chemicals, returns of $4 to $30 an acre were obtained.

Tomato leaf blight (*Macrosporium* [*Alternaria*] *solani*) [ibid., xxiii, p. 194] was controlled by four applications of copper sprays at intervals of 10 to 15 days, beginning on 17th July. The outstanding materials tested were Tennessee tribasic (4 lb. to 100 gals.), copper oxychloride-sulphate (4 lb.), and Bordeaux mixture (4–2–50). The first two were much more effective in spray than dust form. In a severely affected field, yields were increased from 8,000 to 10,000 lb. and the amount of U.S. No. 1 fruit by 20 to 30 per cent. in the later pickings. The gross receipts from spraying were $100 to $110 per acre when both yield and grade were considered.

The evidence showed that at least 9 lb. copper per acre must be used if severely infected fields are to be treated. Approximately this dosage is given by using Bordeaux mixture (2–1–50) or copper oxychloride-sulphate or Tennessee tribasic at 2 lb. per 100 gals. in four or five applications. Thorough application is necessary, and four or five nozzles per row should be used. Spraying against *A. solani* also serves to control various fruit rots. *Phytophthora infestans* occurred in a severe form in a commercial field where various copper compounds had been applied four times, and about 6 tons fruit per acre were saved. In addition, the spraying resulted in a reduction in the cost of the labour employed in harvesting, the commercial pickers, to pick a ton of fruit from the sprayed plots, taking only 21 per cent. of the time they required to pick the same amount from unsprayed plots.

In 1942 fermate (2 lb. per 100 gals.) reduced tomato infection by anthracnose (*Colletotrichum phomoides*) [ibid., xix, p. 65; xxii, p. 157] from 16·6 to 2·9 per cent. in one field, and from 32 to 1·4 per cent. in another.

In tests made in 1942 with commercial cabbage varieties resistant to yellows [*Fusarium conglutinans*: ibid., xxii, p. 291] to ascertain whether seed distributed from 1943 plantings had the required resistance, 29 different resistant strains of 12 cabbage varieties were tested in infected soil in the greenhouse, and only two fell short of requirements.

The 1942 season was marked by the most severe epidemic of hop downy mildew

[*Pseudoperonospora humuli*: ibid., xxii, p. 407] so far experienced in New York. Both this disease and powdery mildew [*Sphaerotheca humuli*: ibid., xxi, p. 246], however, were controlled, and a full crop of disease-free Late Cluster hops was produced, by treatment with Bordeaux mixture (6-4–100), zinc sulphate plus lime (6-4-100), or yellow cuprocide (1½–100). To each of these, wettable sulphur was added at the rate of 5 lb. per 100 gals. Four bi-weekly treatments, beginning in the middle of June, adequately controlled the disease when about 1,200 gals. spray per acre were used during the season, while a loss of 50 to 90 per cent. of the crop was sustained in unprotected gardens.

In spraying and dusting tests against Lima bean downy mildew [*Phytophthora phaseoli*: ibid., xxi, p. 478], the materials used included Bordeaux mixture (4-4-50), copper oxychloride sulphate, yellow cuprocide, spergon, and fermate sprays, and copper-lime (20–80), red cuprocide, yellow cuprocide, spergon, and fermate dusts. Among the sprays, Bordeaux mixture gave outstanding control, while copper oxychloride sulphate was moderately satisfactory. Yellow cuprocide at ¾ lb. per 100 gals. did not give control under the epidemic conditions prevailing. Spergon and fermate were of little value either as sprays or dusts.

The desirability of growing a second crop of potatoes for use as seed in the following season depends, under Long Island conditions, upon whether this second crop can be kept free from disease. When seed stock with a very low leaf-roll content was planted on land which had not grown potatoes that season and had a low rate of aphid infestation, second-crop Irish Cobbler potatoes were produced with field reading of only 4 per cent. leaf roll. Growers' second-crop stocks showed 22 to 50 per cent. leaf roll.

Potato seed-piece decay due to a species of *F.* was effectively reduced by treatment of the seed stock with yellow oxide of mercury (1 lb. to 30 gals. water) before cutting.

A stock of Brittle Wax bean seed was found carrying 1 per cent. infection by *C. lindemuthianum*, the first record of such fungus-seed association in hand-picked bean seed for ten years.

F. oxysporum formed sclerotia on seeds in five samples of garden and sweet peas, but no pathogenicity beyond invasion of the pods and seeds was demonstrated. Nearly half of the 160 stocks tested carried *Ascochyta pisi*-infected seeds, while *Mycosphaerella pinodes* was found less frequently. *A. pinodella* was associated with one seed stock.

A consignment of groundnut seed from a southern grower contained several lots of heavily diseased seed. When pre-germination seed treatment of these lots was neglected, accurate germination tests could not be completed. Species of *F.*, *Sclerotium*, *Alternaria*, *Curvularia*, *Basisporium*, and *Rhizoctonia* were commonly isolated. Only the *F.* species were highly pathogenic. *Rhizopus nigricans* [*R. stolonifer*] and a soft-rotting bacterium severely injured seedlings in the germinator. These fungi were controlled by new improved ceresan.

Arasan controlled moulds on most seeds, and appeared to inhibit the growth of *Diplodia zeae* in maize seed. It adhered without causing injury. It compared favourably with semesan in the control of *A.* [? *brassicae*] on cabbage seed, and greatly increased stands in soil-indexing of beans, cabbage, maize, and pea seed. By replacing the mercurials, arasan will conserve the national supply of mercury. Du Bay 1452C, with 3·2 lb. mercury in each 100 lb. dust, is as effective as new improved ceresan with 3·8 lb., or mercury chloride, with 74 lb.

Du Bay 1452C, under study as a 'bunticide' [i.e., against *Tilletia caries* and *T. foetida*], also proved to be valuable against moulds and as a seed protectant. In a study of spring grain seed treatments it caused no injury and compared favourably with new improved ceresan in increasing the emergence of barley and oats. In most cases, new improved ceresan increased the yield of oats, a dosage

of ¼ oz. per bush. being about as effective as one of ½ oz. This also applied to barley and flax. In improving wheat stands new improved ceresan was consistently superior to other chemicals. In the control of wheat bunt arasan, leytosan, spergon, U.S.R. 604, U.S.R. 601, and Du Bay 1228E were similar to copper carbonate and new improved ceresan. Only Du Bay 1228E and U.S.R. 601 gave promising results against smuts of oats [*Ustilago avenae* and *U. kolleri*].

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1942–43*, Part I, pp. 125–145, 9 figs., 1943.

This report [cf. *R.A.M.*, xxiii, p. 92] contains the following items of interest. In further breeding work by I. E. Melhus, nine watermelon varieties developed for resistance to either wilt [*Fusarium bulbigenum* var. *niveum*] or anthracnose [*Colletotrichum lagenarium*] were crossed in various combinations and selfed. Some lines are now in the F_3 generation. Two seem very promising, carrying marked resistance, good quality, and earliness.

H. C. Murphy states that the 1942 oat crown rust [*Puccinia coronata*] epidemic was one of the severest recorded. Owing to relatively lighter infection in the corn belt states, however, the reduction in total oat production for the United States was less than in 1938 or 1941. The Bond-hybrid selections showed outstanding resistance in all nurseries. The Victoria-hybrid selections were only slightly less resistant, except in nurseries where race 41 and other races virulent on Victoria appeared to be present. Thirty-three races of crown rust were identified among 147 isolates from collections made in 33 or 37 nurseries. This comparatively large number of races indicates the highest degree of specialization observed in *P. coronata*. Since annual race surveys were begun in 1927, 71 races have been identified. In 1942, races 1 and 6 were the most widespread and prevalent, as they have been since 1938. Races 41, 50, and 52, which attack Victoria, and races 45, 57, 68, and 69, which infect Bond, were identified. No race attacking both Victoria and Bond has been found in the United States. Numerous crosses are available which offer a source of combined potential resistance to all races of both rusts [*P. coronata* and *P. graminis avenae*] and both smuts [*Ustilago avenae* and *U. kolleri*] known in North America.

Halo blight [*Pseudomonas coronafaciens*] was again prevalent throughout Iowa in 1942, and caused considerable damage. Boone, Hancock, and Eihan were the most susceptible of the named varieties. Marion, Rainbow, Albion (Iowa 103), Burt, and Nakota were heavily infected. Gopher, Swedish Select, Tama, and Vicland were moderately affected. Fulghum showed outstanding resistance. Kerson, Sac, Iogold, and Iowar were moderately resistant. Selections from D69 × Bond were outstanding as a group for resistance.

A test by I. E. Melhus made to determine the amount of stem rot [*F. batatatis* and *F. hyperoxysporum*] that developed on sweet potatoes after they were set in the field indicated that all the infection came with the slips or that all field infection occurred before 15th June, when the first record was made. Five different slip disinfectants for stem-rot control were compared, using slips of the susceptible Nolte variety from the same hotbed. Fungicide 569A, an organic compound containing no mercury or other heavy metal, and used at the rate of 1 lb. in 8 gals. of water, gave 5·9 per cent. infection, as against 24 per cent. in the control; spergon came next in efficiency, with 14·8 per cent. infection. Semesan Bel definitely injured the slips and gave the lowest stand and the highest amount of disease (25·4 per cent.).

G. Semeniuk and I. E. Melhus state that in one test most of the isolates obtained from seed pieces and roots of onion seedlings showing post-emergence damping-off and stunting were *Pythium* spp. In the more advanced stages of necrosis, *Rhizoctonia* and *Fusarium* spp. were obtained from root lesions. The

Pythium cultures were identified in part as *P. debaryanum*, *P. irregulare*, *P. mamillatum*, and *P. graminicola*.

A yellowing and death of the leaves which occurred in the middle of July, 1942, on onions grown commercially on muck soil was caused by *Phytomonas alliicola* [ibid., xxi, p. 325], which was abundant in the outer scales of the young bulbs. The condition disappeared with the formation of new leaves, but at harvest time a high percentage of the bulbs showed bacterial neck rot [unspecified], which caused a loss of crop estimated at 15 to 25 per cent.

G. C. Kent and I. E. Melhus state that in two years' tests elgetol applied as a late dormant spray to red cedars infected by cedar-apple rust [*Gymnosporangium juniperi-virginianae*: ibid., xxii, pp. 261, 289] greatly decreased spore production. An apple-scab [*Venturia inaequalis*] survey indicated that in most years the ascospores are ripe for discharge when or soon after the trees begin to leaf out. Two sprays are then necessary before blooming.

I. E. Melhus, J. N. Martin, and H. C. Murphy found that stands and yields of wheat, oats, barley, sugar beet, flax, and lucerne were greater on plots treated the previous autumn with chloropicrin against soil-inhabiting plant pathogens than they were in untreated plots. In most cases, the second stand count on the treated plots showed an increase over the first. In the case of barley, wheat, and sugar beet the yields in the treated plots were, respectively, 5, 2·4, and 1·8 times those in the untreated. Heavy applications of sodium nitrate (broadcast at the rate of 800 lb. per acre) and the same amount of complete fertilizer (6-8-12) prevented field oats from becoming stunted and chlorotic, the plants producing new roots and replacing those badly infected by *Pythium*.

G. C. Kent and I. E. Melhus state that the cause of honeysuckle leaf blight is *Herpobasidium foliodistortum* Gould.

C. S. Reddy, E. L. Waldee, and I. E. Melhus state that planting potato seed pieces at a depth of 10 in. in raw alkaline peat and covering with 2 in. of the peat appeared to decrease scab (*Actinomyces scabies*), but the deep planting decreased yield. Sulphur, broadcast on alkaline peat at the rate of 1 ton per acre decreased scab severity and increased yields. The treated tubers were much superior in appearance to the untreated.

G. C. Kent, I. E. Melhus, and A. T. Erwin carried out preliminary studies to ascertain whether raising the water-table in peat soil would induce infection of potatoes by *A. scabies*. In two tests in cans 21 in. in diameter and holding 21 in. of soil, a water-level above 13 in. from the surface inhibited tuber formation. A constant water-level at 13 in. did not decrease yield or markedly increase scab. Periodic flooding of the peat did not appear to influence infection.

On p. 198 of this report a table is given by E. C. Volz showing the degree of susceptibility to black spot [*Diplocarpon rosae*] of a large number of rose varieties.

D. R. Shepherd and I. E. Melhus state that during 1942, barberry eradication survey activities in Iowa extended into 31 counties, and covered 1,819 sq. m. Nine thousand and twenty-six bushes were destroyed on new and re-infested properties. Some 18 per cent. of the 636 old properties inspected were still infested. There are known areas in 36 counties totalling 3,700 sq. m. with scattered barberries that have developed from the seed of plants previously destroyed. These areas should be re-inspected before the bushes produce seed.

Pathology and mycology of Corn.—*Rep. Ia agric. exp. Sta., 1942* **43**, Part II, pp. 52–57, [? 1944].

In this report [cf. *R.A.M.*, xxiii, p. 12] R. H. Porter and W. N. Rice state (on p. 31) that during the period under review isolations from cabbage seeds in Iowa gave *Alternaria brassicae* and a bacterial vascular parasite closely resembling *Phytomonas* [*Xanthomonas*] *campestris*. This latter organism was also isolated

from radish seeds, together with a species of *Torula* causing spots on the cotyledons. *Colletotrichum glycines*, and *Fusarium* sp., *Gibberella* sp., *Phomopsis* sp., and *Alternaria* sp. were isolated from soy-bean seeds, all being associated with seed decay and some with seedling blight. Hot-water treatment of cabbage seed against black rot [*X. campestris*] was ascertained to be almost non-injurious to the seed when the temperature was controlled to within 1°, little or no damage resulting from 30 minutes' soak at 50° C. The treated seed was free from *X. campestris* and *A. brassicae*, and when dried was treated with zinc oxide to prevent decay.

E. W. Lindstrom (p. 45), describing genetic investigations of maize resistance to bacterial wilt [*X. stewarti*: ibid., xx, p. 527; xxi, p. 330], states that for a basic understanding of the nature of mutative changes in bacteria, especially virulence mutations, not only the rate of mutation, but also its relation to temperature must be known. It was ascertained that the mutation rate in a stable strain showed a good linear relation with temperature. The mutant curve of an unstable strain was found to depart significantly from any linear relation of temperature and mutation rate, which indicated a basically different nature. It is evident that the hereditary basis in bacteria does not differ significantly from that of other forms of life in point of stability.

From a single-cell culture of *X. stewarti* with medium-plus virulence 55 natural mutant colonies were selected, tested for repeatability, and stabilized. The basis of selection was colony morphology, mainly different degrees of roughness, smoothness, and colony size. With the highly susceptible inbred line GB134 as the host tester strain, these 55 mutants plus six parental bacterial cultures were tested for virulence. It was found that great variations in pathogenicity had been isolated by the mutated strains; the greater number were lower than the parental level of virulence. Only three were higher, and of these only one was significantly higher (lesion index 84, as compared with parental index of 73·8). The 55 mutant strains also differed widely in their colony morphology; in general the more virulent strains are of the smooth, sticky type. This experiment shows that mutative changes occur naturally on artificial media at room temperature. Earlier work has shown that within the living host there may be a differential selection for virulence. High virulence is favoured in resistant hosts, low virulence in susceptible ones. With mutations for increased virulence arising in host plants with a high level of resistance, there is an evident possibility of an epidemic outbreak.

I. E. Melhus and G. C. Kent state that in tests of ten commercial detergents used as surface tension depressants in the inoculation of maize with *Ustilago zeae* the best was monobutylamine oleate at 0·4 per cent. in carrot decoction. This gave a low tensiometer reading, low phytocidal and fungicidal action, and permitted a high percentage of severe infection. It had the advantage over the triethanolamine oleate, which was almost as satisfactory, of being a stable commercial product. In inoculating seedling maize the sporidial suspension in carrot decoction plus a surface-tension depressant is introduced into the space immediately under the coleoptile tip of a three- to six-day old seedling with a hypodermic syringe. This technique made it possible to determine the reaction of a maize strain 14 to 21 days after planting in the greenhouse.

In an experiment by I. E. Melhus pigs were fed with maize in which over 80 per cent. of the kernels were infected by *Diplodia zeae*, 12 per cent. by *Gibberella saubinetii* [*G. zeae*], under 2 per cent. were free from infection, and only 4 per cent. were germinable [cf. ibid., xxiii, p. 100]. They also received buttermilk and lucerne hay. After six weeks of this feeding the animals appeared healthy. The average gains per pig were 55·6 lb. for the controls fed on healthy maize, and 36 lb. for the others. The former required 6 lb. of maize to produce 1 lb. gain, and the latter 7·6 lb. No toxic effects were found in any of the carcasses. In a

second test, maize rather more highly infected with *D. zeae* was used. The average gains per pig were 196 and 156 lb. for the healthy and diseased maize, respectively, and again no evidence of toxic effect was found.

G. Semeniuk, C. S. Reddy, I. E. Melhus, E. W. Lindstrom, and G. F. Sprague state that 81 inbred lines and 49 single crosses of dent maize were inoculated in the stalks with *D. zeae* in the field in mid-August and examined in late September. Significant differences were found within each of these two groups in extent of the inoculated internode rotted by *D. zeae* and in the percentage of stalks dead from natural causes. Highly significant correlation coefficients were obtained within the group of single crosses between (1) the extent of internode rotted in 1941 and that rotted in 1942 ($r = +0{\cdot}72$), (2) the extent of the internode rotted and the percentage of stalks dead from natural causes ($r = +0{\cdot}58$), and (3) the percentage of stalks dead from natural causes in 1941 and 1942 ($r = 0{\cdot}81$). A non-significant correlation ($r = +0{\cdot}14$) was obtained within the group of inbred lines between the extent of internode rotted by *D. zeae* through artificial inoculation and the percentage of stalks dead from natural causes.

Sixteen inbred lines were transplanted to the field in the seedling stage (plumules approximately 1 in. long) after being grown in steamed sand in the laboratory from seed sprayed with a suspension of *D. zeae* spores. Premature dying of lines R4 and 1198 only was noted in the autumn. Direct planting in the field in 1941 and 1942 of seed sprayed with *D. zeae* spores did not result in any premature dying of inbred lines or single crosses. Planting seed in rows in the field with a third of a teaspoonful of *D. zeae* inoculum under each seed resulted in the premature death (in 1940 and 1941) only of inbred line L289.

On 6th and 7th April, 1943, G. Semeniuk and H. J. Barre inspected in eight localities 37 steel bins each containing 3,000 bush. maize placed there in the previous autumn [ibid., xxii, p. 165]. Of these, 28 showed a mould-encrusted central apical layer of maize ranging in radius up to two-thirds of the radius of the bin and in depth from 6 in. to 2 ft. In spite of the exceptionally cold and prolonged winter, mould activity was progressing with moisture and heat liberation, chiefly through the action of *Penicillium viridicatum*, which was causing the incrustation. *Aspergillus flavus* was often found beneath this encrusted layer, and immediately below, in the non-caked and fairly dry maize, species belonging to the *A. glaucus* group occurred. Of the few fungi examined for their heat-producing capacity, *A. flavus* appeared to be the most vigorous. Marked heating of maize in bins where this fungus was present was noted in the early spring of 1943.

Barducci (T. B.). **Memoria anual de 1941 del Departamento de Genética Vegetal, Estación Experimental Agrícola de La Molina, Lima, Peru.** [Annual Report for 1941 of the Department of Plant Genetics, Agricultural Experiment Station of La Molina, Lima, Peru.] –112 pp., 47 figs., 2 diags., 74 graphs, [? 1942. Received June, 1944. English summary.]

This report contains the following items of phytopathological interest [cf. *R.A.M.*, xxi, p. 517]. The statistical analysis of the data secured in a 'Latin square' experiment designed to compare the performance of 13 selections of Tangüis cotton resistant to wilt (*Verticillium*) [*albo-atrum*: ibid., xxii, p. 166] with that of the control (Hualcará current season), revealed the significant superiority of 12 of the former, which outyielded the latter by an average of 4 gm. per plant (3·1 per cent.). The loss per annum for the country from cotton wilt may be conservatively estimated at 2,500,000 soles [£1= 26·16 soles, 1941 maximum rate of exchange]. Of two promising selections, Nos. 12–38 and 30–38, tested in a hot bed inoculated with the fungus and maintained at a temperature of 22° C., the

former yielded 11 'phenotypically immune' plants and the latter 14 for further trials.

Of 33 barley varieties tested during the period under review for their adaptability to Peruvian conditions, notably in respect of resistance to mildew (*Erysiphe graminis*), the most serious disease of the crop, the best were Chinerme, California Mariot, and Psakwon.

Rye has of late suffered extensive damage from rust [*Puccinia dispersa*], and the reactions of 34 varieties to this disease are under investigation.

A table is given showing the reactions of 3,145 selected lines, 670 varieties, and 121 mostly imported hybrids of wheat to black, brown, and yellow rusts (*P. graminis*, *P. triticina*, and *P. glumarum*) during the months of September to November, inclusive, in plots surrounded by the Mentana variety (highly susceptible to *P. graminis*). Scarcely any infection developed in September except from brown rust, which attacked the selections, varieties, and hybrids to the extent of 4·8, 5·0, and 4·1 per cent., respectively. In October, however, the incidence of black and brown rusts on the three groups amounted to 59·8, 78·2, and 85·1, and 44·5, 73·7, and 58·6 per cent., respectively, while by November the figures had risen to 100·0, 99·7, and 99·2, and 49·5, 80·6, and 63·6 per cent., respectively. The variety group was the only one to sustain more than a trace of damage from yellow rust (7·9 per cent. in both the later months). October and November are the critical months for infection by *P. graminis*, the most serious disease of wheat in the region, and on the basis of these data it is recommended that sowings of a variety resistant to *P. graminis*, e.g., 38 M.A.×San Martín 28, should be made during May or June in the Lima Valley in order to reach maturity before the critical period for infection.

White-flowered flax varieties in general, and J.W.S. and Blenda in particular, were more susceptible to rust (*Melampsora lini*) in a trial of 14 than the blue-flowered.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lv, 3, pp. 99–102, 6 figs., 1944.

Symptoms of boron deficiency in pome fruits [*R.A.M.*, xxi, p. 529; xxii, p. 140] appear as (*a*) superficial cork, (*b*) cork, (*c*) internal cork [ibid., xxi, p. 406], and (*d*) corky core. Superficial cork generally affects very small to half-grown fruit. The skin turns brown and may be dry and cracked, especially round the calyx end. Cork itself is shown externally by fruit malformation caused by the presence of irregular depressions and by raised, brown or reddish spots. In New South Wales the commonest form of the disorder is internal cork. Corky core is characterized by a general browning and death of the core, where cavities sometimes form.

Twig and foliage symptoms take the forms of incipient die-back, die-back, and rosette. In the first, the leaves on current-season twigs turn yellow during late summer and show red veins; they are rather convex or distorted. Small, brown, necrotic areas develop at the tips and margins of the leaves and in the bark tissue at the ends of the twigs, which may die from the tips downwards. Die-back, when due to boron deficiency, first appears in the spring, when buds apparently normal in all other respects fail to develop. The affected twigs die back from their tips, and an abnormal number of small branches may later develop from below the dead portion. This process may be repeated, with the production of an excessive number of small branches. Rosette takes the form of dwarfed, thickened, brittle leaves arising from nodes separated by very short internodes.

Control consists in spreading ¾ to 1 lb. borax or ½ to ¾ lb. boric acid smoothly round fully-grown trees once every two or three years. If preferred, the borax may be applied in a spray, 1 lb. being added to 100 gals. of the lime-sulphur-lead arsenate cover spray in November. Control is helped by dressings of sheep or

stable manure at the rate of 3 to 5 tons per acre, or leguminous green crops may be sown in autumn and ploughed in during winter.

TYNER (L. E.). **Effect of media composition on the numbers of bacterial and fungal colonies developing in Petri plates.** *Soil Sci.*, lvii, 4, pp. 271–274, 1944.

At the Dominion Laboratory of Plant Pathology, Edmonton, Alberta, the addition of boric acid to Lipman and Brown's synthetic medium (*Zbl. Bakt.*, Abt. 2, xxv, pp. 447–454, 1910) at a concentration of 1·8 gm. per l. entirely suppressed bacterial growth while permitting satisfactory development of soil fungi, similar results being obtained on potato dextrose agar with the chemical at a strength of 2·1 gm.

STAPP (C.). **Der Pflanzenkrebs und sein Erreger Pseudomonas tumefaciens. XII. Mitteilung : Die Wirkung von Apfelemanation auf Erreger und Wirtspflanze.** [Crown gall and its agent *Pseudomonas tumefaciens*. Note XII: The effect of Apple emanation on agent and host.] *Zbl. Bakt.*, Abt. 2, cvi, 8/10, pp. 167–171, 3 figs., 1943.

The gaseous emanations of three Red Autumn Calville apples with a powerful aroma exerted neither an inhibitory effect on the growth of *Pelargonium zonale* cuttings and *Datura tatula* seedlings inoculated with *Pseudomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xxii, p. 382] nor a stimulatory action on the development of the pathogen, which was promoted, however, by the high relative humidity prevailing under the bell jars. The acceleration of crown gall neoplasms observed by Nábělek under the influence of apple emanations [ibid., xviii, p. 790] must therefore be restricted to particular conditions. Moreover, not only did the aroma not impede the development of *Bact. tumefaciens* on bouillon agar, but a half apple laid directly on the medium, with the freshly cut surface downwards, actually expedited the growth of the organism.

ELROD (R. P.). **Biochemical and serological studies of the Erwineae.** *Abstr. Doct. Diss. Ohio Univ.* 36, pp. 83–89, 1942.

Physiological differentiation within the soft rot group of bacteria comprised by *Erwinia carotovora*, *E. aroideae*, *E. phytophthora*, and *E. solanisapra* [*R.A.M.*, xxii, p. 127] could be effected in the writer's experiments on 18 cultures of these organisms only on the basis of maltose and sorbitol fermentation. Eight of the isolates fermented maltose (maltose +), while 10 failed to do so (maltose –), the corresponding numbers for sorbitol being 7 and 11, respectively. Sera were prepared against 13 of the 18 cultures. Using 1 in 40 as the minimum dilution, cross-agglutination tests revealed 40 reactors (exclusive of the homologues) or 18·1 per cent. of the total possible (221). With the maltose – organisms in maltose sera there was 33·3 per cent. cross reaction, the corresponding figure for the maltose + group being 28·6 per cent. The high degree of cross reaction occurring within these two groups, and the small proportion (4 per cent. of the total) outside them, were found to be statistically significant.

The cross-agglutination reactions were shown to be due to common flagellar components, of which there were at least 22 among the 18 cultures. Somatic antigens, on the other hand, were more type-specific, and similar observations were made in respect of the extracted polysaccharides.

E. amylovora and *E. tracheiphila* proved to be serologically homologous, while the few cultures available of other species outside the soft-rot group, viz., *E. salicis*, *E. lathyri*, and *E. ananas*, were likewise highly specific. The narrow host range of *E. amylovora* and *E. tracheiphila* is in contrast to the heterogeneity of the soft-rot group with their hosts in many unrelated botanical families.

Lovelock (J. E.), Lidwell (O. M.), & Raymond (W. F.). **Vaporization of lactic acid as an aerial bactericide.**—*Nature, Lond.*, cliii, 3894, p. 743, 1 fig., 1944.

After stating that effective bactericidal action by lactic acid vapour does not occur until the concentration of vapour in the air reaches 3·5 mg. per cu. m., the authors describe two forms of apparatus for the utilization of lactic acid in superheated steam. Both types have a maximum output of about 12 gm. of lactic acid vaporized per hour.

Minz (G.). **Parasitic fungi on imported straw.**—*Hassadeh*, xxiv, p. 36, 1943. [Hebrew.]

The following fungi were found on straw imported as packing material for laboratory glassware from the United States: *Urocystis tritici*, *Ustilago avenae*, and *Puccinia graminis* f. *tritici* and f. *avenae* (uredo and teleuto stages). *Urocystis tritici* has not hitherto been found on cereals in Palestine, and the other fungi may represent strains new to this country. The danger of such an introduction of infected material is evident. McAlpine (The rusts of Australia, 1906) stated that *P. graminis* spores were brought into Australia from France on wheat straw in which wine bottles were wrapped.

Minz (G.). **An experiment to control cereal rusts by dusting with sulphur.**—*Hassadeh*, xxiv, 5, pp. 183–185, 1 fig., 1944. [Hebrew.]

Wheat and oats were dusted with superfine Gaza sulphur. Florence wheat (Morocco origin) was dusted as soon as *Puccinia graminis* appeared, five treatments being given from 31st March to 2nd May, 1943. The increase of yield from sulphuring was 53 per cent. The weight of 1,000 seeds was 42·6 gm. for dusted as against 27 for diseased wheat. Mulga oats were dusted from the appearance of *P. coronifera* onwards 13 times from 14th January to 29th April, 1943, at 7- to 9-day intervals. The increased yield of 31 per cent. was not statistically significant. Wheat rusts are more readily controlled because they appear later and the period of their development is short, so that dusting in the critical period prevents rust attack. The economic value of dusting wheat will depend on improved machinery equipment and on the severity of rust attack. In this experiment relatively large amounts of sulphur were applied to insure thorough control (27 kg. for wheat and 17·5 for oats per 1/10 ha. and per treatment). In the case of oats dusting will hardly be economic, even if effective, because leaf rust sometimes appears, under favourable climatic conditions, in the very early growing stage.

Bremer (H.) & Özkan (Mediha). **The cereal rust epidemic of 1940 in Turkey.**—Reprinted from *Zir. Derg., 1941*, 8 pp., (?) 1941. [Turkish. Received July, 1944.]

The results of an examination of 162 samples of cereals received from all parts of Turkey at the Central Institute of Plant Protection, Ankara, are described and tabulated. The year 1940 was marked by a rust epidemic, particularly affecting wheat, *Puccinia graminis* being the most widely distributed species, especially in the west of the country, while *P. glumarum* was more troublesome in the east. *P. triticina* developed only sporadically along the west coast. The high incidence of infection in the west is attributed to an abnormally heavy spring and early summer rainfall, combined with a sufficient degree of heat. The weight per 1,000 grains ranged from 25 to 33 gm. compared with a normal average of over 40.

Cass Smith (W. P.) & Millington (A. J.). **Stem rust of Wheat and its control by breeding resistant varieties.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxi, 1, pp. 1–16, 6 figs., 1944.

During 1943 an epidemic of stem rust of wheat (*Puccinia graminis tritici*), the

most serious experienced since 1934, occurred in Western Australia, causing commonly from 25 to 75 per cent. losses in yield. The wheats grown by the first Australian settlers were late-maturing English and South African varieties, which were subject to almost annual rust attacks or top-withering. Attempts were later made to select or breed rust-resistant varieties, but the problem was eventually solved by growing early-maturing varieties, which, though susceptible to rust, sustain no serious damage. Of the ten physiologic races of the rust, identified by W. C. Waterhouse in Australia, only two, 34 [*R.A.M.*, xxii, p. 95] and 43, occur in Western Australia. Race 34 was also discovered there for the first time in 1943 on the perennial grass, *Agropyron scabrum*. This discovery is taken to indicate that in Western Australia, as in New South Wales [ibid., xiv, p. 619], the fungus probably survives the summer period between wheat crops on grasses. The exact mode of the carry-over of the rust in Western Australia, however, has not yet been determined. Its survival on susceptible out-of-season cereals is believed to be unlikely in the State, where summer rains are unusual, but a carry-over on self-sown plants growing in moist places is considered possible. Weather conditions in Western Australia are stated to be seldom favourable to the development of stem rust, and a review of past years shows that epidemics have occurred infrequently (they are altogether unknown in the north-eastern wheat belt), and only in years when heavy rains had fallen between January and April, and especially in March (cf. in 1915, 1917, 1934, and 1943; also outbreaks in one district only in 1930 and 1939). Apart from the weather, disease outbreaks are associated with an abundance of rust spores on susceptible grasses and self-sown or early-sown wheat; this may become a major factor when ideal weather conditions prevail for a short time only. Important for the spread of rust is moisture accompanied by moderately cool to warm temperatures. Ideal conditions are provided during sultry weather, or when frequent light showers and heavy dews occur, especially when these are followed by a long period of cloudy weather, or when a long succession of cloudy mornings is followed by humid but not hot days.

Fischer (G. W.) & Claassen (C. E.). **Studies of stem rust (Puccinia graminis) from Poa ampla, Avena fatua, and Agropyron spicatum in the Pullman, Washington, region.**—*Phytopathology*, xxxiv, 3, pp. 301-314, 1944.

A tabulated account is given of inoculation experiments on numerous grasses and cereals with monospore cultures of *Puccinia graminis* [*R.A.M.*, xx, p. 536; xxii, p. 483] from *Avena fatua*, *Poa ampla*, and *Agropyron spicatum* collected in the neighbourhood of Pullman, Washington.

The three cultures varied widely in their host ranges, 34 species of grasses and cereals, representing 14 genera and 5 tribes, being more or less susceptible to inoculation from *P. ampla*, while the corresponding figures for the *Avena fatua* collection were 18, 9, and 3, and for that of *Agropyron spicatum* only 7, 3, and 1, respectively. The culture from *Avena fatua* was identified as physiologic race 2 of *Puccinia graminis avenae* [ibid., xvii, p. 308]. The *Poa ampla* strain appears to be a new physiologic race of *P. g. avenae*, judging by the immune reaction to it of 16 out of 17 oats varieties, including Markton and Victory, only Nortex (*A. byzantina*) being attacked. It is a virulent and polyvorous strain, restricted in the main to grasses. The *Agropyron spicatum* culture seems to be distinct from all the known forms of *P. graminis*, *P. g. secalis* being excluded by the immunity of three accessions each of *A. repens*, and rye, and *P. g. tritici* by the negative results of inoculation tests on 12 wheat varieties. In all probability a new form of *P. graminis* has been encountered with a high degree of specialization on *Elymus glaucus* and a few species of *A.* and *Sitanion*.

The uredospores of the three collections did not conform to the established biometric constants of any of the varietal complexes of *P. graminis* but they may

possibly fall within the expected range of variation for the different physiologic races of the several forms of the rust.

Jamalainen (E. A.). **Über die Wirkung von Holzrauch auf den Weizensteinbrand.** [On the effect of wood smoke on Wheat bunt.]—*Valt. Maatalousk. Julk.*, 117, 37 pp., 1942. [Finnish, with German summary. Abs. in *Chem. Zbl.*, cxiv (i), 7, p. 773, 1943.]

The results of tests at the Tikkurila (Finland) Agricultural Experiment Station showed that wheat bunt [*Tilletia caries* and *T. foetida*] cannot be effectively combated by the subjection of the seed-grain to high temperatures, while only partial success was achieved by its exposure to pine wood smoke.

Ramamoorthy (C. S.) & Mundkur (B. B.). **Neovossia indica in culture.**—*Curr. Sci.*, xiii, 2, p. 49, 1944.

In the course of a study on the germination of the chlamydospores of *Neovossia indica* (Mitra) Mundkur [the agent of Karnal bunt of wheat: *R.A.M.*, xxiii, p. 10], the slides bearing these organs were inverted over the surface of potato agar in Petri dishes and the sporidia allowed to drop on to the medium. By the end of a week at 15° C. most of the cultures had produced small, white colonies composed of thick mats of much branched mycelium and numerous secondary sporidia. The smut was successfully subcultured on potato dextrose agar and 3 per cent. malt extract solution. The powdery, brittle, crustaceous, umbonate colonies, with dendritic margins, make satisfactory though rather slow growth at 18°, the mycelium coiling in a peculiar manner, branching, rebranching, and giving rise to secondary sporidia, which are discharged explosively. Both the mycelium and secondary sporidia appear to be entirely monocaryotic.

Minz (G.). **Black point disease of Wheat.**—*Hassadeh*, xxiii, 12, pp. 348–349, 1 fig., 1943. [Hebrew.]

In Palestine the soft spring wheat varieties CCC, Giza 105, and Florence (Morocco origin) were found in 1941 to be affected by black point [*R.A.M.*, xxiii, p. 222] up to 28, 26, and 1·5 per cent., respectively. Anatomical examination of the discoloured parts of the grain revealed the presence of mycelium in the pericarp and testa. *Alternaria* sp. and *Macrosporium* sp. were isolated from cultures and fructifications (?*Pleospora*) were also found. The weight of 1,000 seeds in the affected and healthy CCC wheat amounted to 48·2 and 40·3 gm. and in the Giza 105 variety to 54·9 and 50·7 gm., respectively. This agrees with the findings of Waldron [ibid., xvi, p. 373]. The germination and sprouting of affected seeds were satisfactory.

Buddin (W.) & Garrett (S. D.). **Take-all of cereals in 1943.**—*J. Minist. Agric.*, li, 3, pp. 108–110, 1944.

Take-all (*Ophiobolus graminis*) was more prevalent than usual in England in autumn-sown wheat crops harvested in 1943. In some fields the disease appeared in May, but in most cases infection was not noticed until after the crop had headed. The outbreak was favoured by the winter of 1942–3, when double the normal amount of rain fell in January, causing leaching of soluble nitrogen from the soil, and by a prolonged hot, dry spell in June and early July, when plants with defective root systems were checked in their growth.

Infection was most frequent and most severe in wheat following wheat or barley. Field surveys showed that *O. graminis* declines under a rye grass [*Lolium perenne* and *L. multiflorum*] and clover ley to a relatively low level, but occasionally wheat may sustain appreciable loss after such ley. In some cases, severe outbreaks on wheat were traced to infection of *Agropyron repens*, *Holcus lanatus*, and *Agrostis* sp.

The perpetuation of the fungus on the underground parts of such grasses is probably due mainly to their perennial habit and vigorous growth. Even on the most susceptible annual grasses, such as *Alopecurus agrestis*, the life of the fungus is curtailed by the death of the host at or before the end of the growing season. Infestation of land by these perennial weeds often causes unexpected outbreaks of take-all in crops grown under otherwise excellent rotations.

ELLERTON (S.). **Reaction of Wheat varieties grown in Britain to Erysiphe.**—*Nature, Lond.*, cliii, 3895, pp. 776–777, 1944.

During May, 1944, a moderately heavy outbreak of *Erysiphe graminis* occurred in a wheat yield trial near Maldon, Essex. Attacks of less than average severity were shown by Juliana (mildew score −2·9, significance $P < 0{\cdot}01$), Iron III (−2·7, $P < 0{\cdot}01$), Wilhelmina (−2·6, $P < 0{\cdot}01$), Desprez 80 (−2·5, $P < 0{\cdot}02$), and Weibulls' Standard (−2, $P < 0{\cdot}05$), which are therefore regarded as resistant; of average severity on Victor (0) and Steadfast (0); and of more than average severity on Holdfast (+2·3, $P < 0{\cdot}05$), Little Joss (+3·3, $P < 0{\cdot}01$) and Warden (+9·3, $P < 0{\cdot}001$), which are regarded as susceptible. Other varieties tested were Als (−1·3), Gartons 60 (−0·3), Red Standard (+0·1), Wilma (+0·2), and Yeoman I (−1·5). Of other varieties tested in tests limited to six replications only Picardie showed highly significant resistance (−6·5, $P < 0{\cdot}001$), while there was some evidence that Setter, Steel, Benoist 40, Red Drottning, and Squarehead II were resistant, and Robusta, Redman, and Vilmorin 29 susceptible.

STANDEN (J. H.). **Chemical and physical characteristics of Maize cobs in relation to the growth of Nigrospora oryzae.**—*Phytopathology*, xxxiv, 3, pp. 315 323, 1944.

In a study at the Iowa Agricultural Experiment Station on the physical and chemical characteristics of maize cobs in relation to infection by *Nigrospora oryzae*, poorly-matured specimens were found to be more frequently attacked than well-matured ones. The former were less woody than the latter, and their water-absorbing capacity was greater. Poorly-matured cobs had a higher P_H than well-matured ones [cf. *R.A.M.*, xi, p. 448] and contained more water-soluble substances and available food, especially sugars, which may be lost through a delay in harvesting the ears. The fungus grows well on media containing sugars, peptone, xylan, and hemicellulose, its development on cob-meal agar being particularly luxuriant. Some water-soluble, thermostable substance or substances, apparently organic, present in abundance in poorly-matured cobs, evidently favours the growth of *N. oryzae*. A close relationship was shown to exist between susceptibility to the pathogen and the growth of the latter in response to the addition of cob extracts to the nutrient medium.

VOORHEES (R. K.). **A comparison of some copper fungicides in controlling Citrus melanose.**—*Citrus Ind.*, xxiv, 12, pp. 5–8, 14–15, 6 figs., 1943. [Abs. in *Exp. Sta. Rec.*, xc, 4, p. 495, 1944.]

The results of spraying trials carried out from 1939 to 1942 in commercial citrus groves in three localities of Florida with three up-to-date proprietary copper-containing fungicides and Bordeaux mixture for the control of melanose [*Diaporthe citri*] showed all to be about equally effective against an intensive outbreak of the disease, one application in general sufficing to confer complete protection. On the basis of these data and the outcome of Ruehle and Kuntz's experiments [*R.A.M.*, xx, p. 572], the use of 3-3-100 Bordeaux or its fungicidal equivalent in some form of neutral or basic copper has been almost exclusively adopted in the State for the object in view. To some extent certain copper materials can be

employed on the basis of equivalent metallic copper, though a wide variation in effectiveness was observed per unit of copper.

Winston (J. R.) & Meckstroth (G. R.). **Decay control in Florida Lemons.**—*Citrus Ind.*, xxv, 2, pp. 6–7, 10, 18–19, 22, 1944. [Abs. in *Chem. Abstr.*, xxxviii, 10, p. 2406, 1944.]

The ethylene treatment commonly applied to citrus fruits to improve their colour enhances the susceptibility of lemons to rapid infection by the two chief agents of stem-end rot, *Phomopsis* [*Diaporthe*] *citri* and *Diplodia natalensis* [*R.A.M.*, xxii, p. 430], spoilage by which developed at a faster rate in clipped than in pulled fruits. The decay was arrested, without damage to the rind, by immersion in 8 per cent. borax solution or sodium-ortho-phenylphenol (1·2 per cent. aqueous solution washed off at once, or up to 2 per cent. in the wax emulsion used after gassing). Withering and ageing were retarded by the wax emulsion treatment. *Diaporthe citri* was responsible for most of the rot in non-gassed lemons.

Fawcett (H. S.) & Cochran (L. C.). **A method of inducing bark-shelling for treatment of certain tree diseases.**—*Phytopathology*, xxxiv, 2, pp. 240–244, 1 fig., 1944.

Of the various preparations tested at the California Citrus Experiment Station for their efficacy in the removal of psorosis-diseased bark on 5-year-old Washington Navel and Valencia orange trees, the best was dinitro-ortho-cyclohexylphenol (DNOCHP) at a concentration of approximately 1 per cent. by weight dissolved either in paraffin or medicinal-grade white mineral oil. In a few tests ordinary petrol without tetra-ethyl lead gave some indication of utility as a carrier for the chemical, but its unduly rapid evaporation in warm, dry weather is a disadvantage.

Sherbakoff (C. D.), Miller (P. R.), & Simpson (D. M.). **Use of liquid culture of Fusarium for field inoculation of Cotton.**—*Phytopathology*, xxxiv, 2, pp. 254–256, 1944.

The following simple and inexpensive procedure has given satisfactory results in field inoculation tests to determine the varietal reaction of cotton to *Fusarium vasinfectum* at the Tennessee Agricultural Experiment Station. Hills of five seeds each were planted in Decatur silt loam soil on 22nd June, 1942, round wooden pegs, 1 by 1 by 10 in., set about 4 in. deep in the ground. On 15th July the pegs were removed and the holes thus made filled with ½-pint liquid inoculum in the form of a synthetic nutrient solution on which the fungus had been grown at 80° F. The incidence of infection among the 23 varieties or strains tested ranged from 0 in the two resistant controls, Cook 307 and Seabrook No. 10 (S.I.), to 52·5 per cent. in Trice × Tidewater (578), other highly susceptible sorts including Acala 911 (330–1–1–8), Coker 33–12 (289–3), Coker 100 (994), Stoneville 5 (62), Half and Half (control), Coker Wilds (176), and Acala 911 (330-1–8–4), with 51·9, 50, 44·4, 43·9, 41·7, 41·2, and 40·7 per cent., respectively, while among the more resistant were D.P.L. 11 (51), Coker wilt 100 (resistant control), Stoneville (37-13), Stoneville 37 × Stoneville 5, and Delfos 719 (992), with 5·7, 8·3, 12·0, 14·0, and 15·9 per cent., respectively. The performance of the control varieties in these trials closely approximated to the response expected on the basis of previous greenhouse inoculation tests and common field observations.

Boughey (A. S.). **Physiological Cotton wilt in the Sudan Gezira.**—*Ann. appl. Biol.*, xxxi, 1, pp. 12–18, 1 pl., 5 graphs, 1944.

Observations made during the 1941–2 season in experiments on cotton wilt in the Gezira area of the Sudan [*R.A.M.*, xx, p. 162] indicate that between the 10th and 18th weeks after sowing, i.e., mid-October to mid-December, three factors

may cause water stress in the crop, namely, a drastic reduction in the size of the absorbing system of the plant which occurs at some time during this period and is correlated with maximum boll development, considerably increased day temperatures accompanied by higher evaporation, and a rapid decline in the amount of available water in the soil. It is suggested that a coincidence of these three factors at high intensity results in permanent wilting and death of the plants, while at lesser intensities wilting will be followed by recovery, but with reduction of yield. Support to this hypothesis was lent by experimental data on plant growth, soil water, and atmospheric conditions. It is suggested that wilt can be controlled by delaying the sowing date, using late-maturing cotton varieties, and increasing the frequency and amount of irrigation. The present disappearance of wilt from the southern and central Gezira is attributed to exactly these measures, which had been adopted for the control of black arm. The author expresses the opinion that a return to the normal early dates of sowing would lead to considerably increased losses from wilt.

Knight (R. L.). **The genetics of blackarm resistance. IV. Gossypium punctatum (Sch. & Thon.) crosses.**—*J. Genet.*, xlvi, 1, pp. 1–27, 2 pl., 1944.

Further studies in the Sudan on the genetics of blackarm (*Bacterium* [*Xanthomonas*] *malvacearum*) resistance in cotton [*R.A.M.*, xx, p. 161] showed that BAR 3, a strain of *Gossypium punctatum* with grade 1 to 2 resistance (0 = immunity, 12 = full susceptibility), contains two linked blackarm-resistance genes, B_2 and B_3. B_2 is the gene responsible for resistance in the *G. hirsutum* varieties, and B_3 is a new semi-dominant factor conferring grade 7·1 to 8·1 resistance on Sakel (*G. barbadense*) when heterozygous and grade 4·1 to 7·1 when homozygous. No marked effect is exerted by any minor or modifying factors in BAR 3.

The resistance of Gambia Native is also due to B_2 and B_3, but Gambia also possesses minor factors, and crosses between it and Sakel showed blending inheritance in F_2.

Resistant and susceptible strains of Hindi Weed cotton exist. Resistant selections contained B_2 unaccompanied by weak factors. Darfur Local, a cultivated *G. punctatum* strain from the western Sudan, was heterogeneous for resistance, but gave evidence of the presence of B_3 and, it is assumed, of B_2.

Emmons (C. W.). **Allescheria boydii and Monosporium apiospermum.**—*Mycologia*, xxxvi, 2, pp. 188–193, 1 fig., 1944.

Recent studies in Maryland showed *Allescheria boydii* [*R.A.M.*, ii, p. 226] to be the ascocarpic stage of *Monosporium* [*Scedosporium*] *apiospermum* [ibid., xix, p. 537]. Both fungi have been associated with mycetoma of the foot. A strain of *S. apiospermum* after six years in culture began to produce ascocarps identified as those of *A. boydii*. Cultures made from 150 single ascospores and 179 single conidia gave rise to colonies identical in appearance and in the production of conidia and ascospores. Single-spore cultures invariably produced colonies bearing abundant ascocarps, indicating the homothallic nature of the fungus. The conidia, which vary greatly in size (3·5 to 6 by 3 to 10μ), are borne singly at the tips or laterally on simple or branched conidiophores of greatly varying length, are elliptical, egg-shaped, or clavate, occasionally subglobose, with a truncate base and somewhat thickened brown walls. The ascocarp is initiated by a coiled ascogonium, which remains visible for some time at one side of and external to a mass of small pseudoparenchymatous cells which produce the ascocarp. The first ascocarps to develop in culture may measure up to 130μ in diameter, while those developing later or under crowded conditions may mature when only 50μ in diameter. The cleistocarpous perithecium is brown and composed of a few cell layers so thin that asci and ascospores can be seen by transmitted light through it.

The asci are at first clavate, later subglobose, with eight ascospores, which are elliptical with slightly pointed ends and faintly brown walls, and measure 4 to 4·5 by 7 to 7·5μ.

Munin (F.). **Molds and their occurrence in storage butter.**—*Fette u. Seifen*, xlix, pp. 605–607, 1942. [German. Abs. in *Chem. Abstr.*, xxxviii, 10, p. 2404, 1944.]

Dark-coloured moulds of the genera *Cladosporium* and *Penicillium* are stated to be very destructive to stored butter in Germany, species of the former, moreover, penetrating deeply into the substance and utilizing the oxygen, thereby increasing the spoilage. The following preventive measures are recommended: thorough treatment of wooden tanks and utensils with boiling water, chlorination, and aeration, followed by rapid drying; use of teak (preferably aged) in preference to pitch pine for dairy implements; and the utilization of a boiled salt solution in place of surface water in the process of butter manufacture.

Schuster (M.). **The nature of resistance of Flax to Fusarium lini.**—*Phytopathology*, xxxiv, 3, p. 356, 1944.

In a study at the Minnesota Agricultural Experiment Station on the nature of resistance to physiologic races 6 and 11 of *Fusarium lini* in two flax varieties, Bison C.I.389, grown in soil inoculated with the former race, to which it is susceptible, yielded the fungus from the roots on the day of emergence of the seedlings, but not from the apex until a week later. Thereafter, the pathogen was present throughout the plants, all of which were wilted within 20 days. When the same variety was grown in soil inoculated with race 11, to which it is resistant, *F. lini* was isolated exclusively from the primary roots near soil-level. In Punjab C.I.20, susceptible to both races, the fungus was rife throughout the plants a day or two after emergence. Thus the resistant Bison does not actually exclude the parasite, but confines the less virulent race 11 to the root and crown tissues and retards by several days the development and spread of the more pathogenic race 6. No such inhibitory action is exerted by the susceptible Punjab, in which the fungus is rapidly disseminated through the tissues.

Partial wilting was fairly common in certain varieties included in these experiments, while in other cases plants killed to the ground gave rise to healthy new shoots. *F. lini* was isolated from segments of wilted branches on partially infected plants, but not from the green portions of the same.

Flor (H. H.). **Relation of rust damage in seed Flax to seed size, oil content, and iodine value of oil.**—*Phytopathology*, xxxiv, 3, pp. 348–349, 1944.

Since 1939 flax rust (*Melampsora lini*) has become increasingly destructive in North Dakota, where it is estimated to have reduced the seed yield by 25 per cent. (2,000,000 bush.) in 1942. This development has necessitated the gradual replacement of the susceptible Bison by more resistant varieties. In a test to determine the effect of the disease on the seed size, oil content, and iodine number of the oil [*R.A.M.*, xxii, p. 168] obtained from a stand of Bison, significant negative correlations were established between iodine number and yield, seed size, and oil content, indicating that a reduction of the crop by rust does not lower the iodine number of the oil to the same extent as the adverse factors of drought or high temperature.

Brown (J. G.) & Boyle (Alice M.). **Bacterial soft rot of Sansevieria.**—*Phytopathology*, xxxiv, 3, pp. 350–351, 1 fig., 1944.

A technical description is given of the bacterium responsible for a soft rot of *Sansevieria trifasciata* (grown for its fibre, bowstring hemp, in parts of the tropics), at the University of Arizona. Conspicuous features of the disease include chlorosis

and a water-soaked spotting of the foliage, collapse of the leaves to one side and basal rot, water-soaking and a straw-coloured discoloration of the rootstocks, and shrivelling and desiccation of the roots. The organism resembles *Erwinia carotovora*, *E. aroideae*, and *E. phytophthora* in its negative response to the Gram stain, in its aerobic nature, in the liquefaction of gelatine, reduction of nitrate, coagulation of milk and litmus milk, acid production in dextrose, *l*-arabinose, *l*-xylose, and raffinose, and with one or other of the related bacteria in various additional particulars. However, it differs from the other species, e.g., in its mobility by one or two polar flagella, failure to reduce litmus, gas production in test sugars, and cultural characteristics on potato. The agent of the soft rot is, therefore, provisionally referred to the group of intermediates between *E. carotovora* and *E. aroideae* proposed by A. R. Stanley (*Bull. W. Va agric. Exp. Sta.* 287, 1938) [cf. *R.A.M.*, xxi, p. 325 *et passim*].

Chesters (C. G. C.) & Hickman (C. J.). **On Pythium violae n.sp. and P. oligandrum Drechsler from cultivated Viola.**—*Trans. Brit. mycol. Soc.*, xxvii, 1–2, pp. 55–62, 2 figs., 1 chart, 1944.

From 1932 to 1934, the authors examined numerous exhibition and bedding varieties of *Viola* and pansy [*V. tricolor*] from all parts of Britain affected by a soft rot of the stem near the collar or of the roots. From the diseased tissues they isolated several species of *Pythium* [cf. next abstract]. The species most frequently isolated is named *P. violae* n. sp. From diseased stems and roots of exhibition and seedling *Viola P. oligandrum* [*R.A.M.*, xxi, p. 119] was isolated, apparently a new record for Britain. In this country, the stem and root rot complex of *Viola* is due to attacks of *P.* spp., *Rhizoctonia* [*Corticium*] *solani*, and *Myrothecium roridum* [ibid., xxiii, p. 191] alone or in various combinations.

The pathogenicity of *P. violae* to *Viola* was proved by inoculation tests in pot culture in sterilized soil and potting compost and in garden beds of fresh loam. In culture on clear maize extract agar and oat extract agar the mycelium consists of intra- and extramatrical hyphae, becoming sparingly septate in old cultures. The sporangia, infrequent in host tissues and agar cultures, were spherical or subspherical, terminal or intercalary, 14 to 42 (average 26·2)μ in diameter, and germinated directly by one, less often two, germ-tubes. The terminal or intercalary, smooth, spherical, or subspherical oogonia measured 16 to 34 (average 25·7)μ in diameter. The androgynous, occasionally diclinous antheridia were, when androgynous, each supported on a brief antheridial hypha arising from the oogonial stalk immediately below, or at a short distance from, the oogonium, broadly barrel-shaped or cylindrical, slightly curved and broader than the stalk, usually contacting the basal hemisphere of the oogonium. The diclinous types were cylindrical, seldom curved. In both types, only the broad, rounded apex is applied to the oogonium, a narrow fertilization tube leading from it and piercing the oogonial wall. There are one or two antheridia to each oogonium, sometimes as many as eight. The smooth, spherical oospores, 11 to 28 (average 20·6)μ never filled the oogonial cavity. Occasionally two oospores occupied one oogonial lumen.

The most salient characters of this species are the very restricted occurrence of sporangia in host tissue and culture, the absence of swarm spore production, the dark, oily contents of the very prominent oogonia, and the abundant oospore production. Distinguishing characters from allied species are given. *P. violae* also differs from the two species of *P.* (A and B) isolated from *Viola* by Van Eek [ibid., xviii, p. 112].

The isolations referred to *P. oligandrum* show the following characters. On clear maize extract agar the intramatrical mycelium consists of primary hyphae, 2 to 6 (usually 2 to 4)μ in diameter, with lateral branches ending in tufts of short, delicate hyphae. In water culture simple or compound, terminal or intercalary

sporangia are abundant. The terminal sporangia, when simple, are spherical, measuring 10 to 28 (average 20·8)μ in diameter, or piriform, obpiriform, or oval, measuring 18 to 40 by 16 to 20 (average 24·1 by 18·1)μ, and when compound consist of two to five ovoid or highly irregular elements closely connected by cylindrical hyphal segments. Intercalary sporangia are formed on a portion of the mycelium clearly enclosed by two septa. On this the sporangia occur singly or in series as subspherical swellings 14 to 28 by 16 to 32 (average 22·5 by 23·7)μ, or as sessile, irregular lateral lobes. The diameter of the oogonia, including spines, is 24 to 34 (average 27·6μ. The spherical, smooth oospores, almost filling the oogonial lumen, measure 17 to 26 (average 21·3)μ in diameter.

PAPE (H.). **Die Pythium-Wurzelfäule der Stiefmütterchen in den Vierlanden und Versuche zu ihrer Bekämpfung.** [*Pythium* root rot of Pansies in the Vierlanden and experiments on its control.]—*NachrBl. dtsch. PflSchDienst*, xxii, pp. 75–77, 5 figs., 1942. [Abs. in *Zbl. Bakt.*, Abt. 2, cvi, 8–10, pp. 204–205, 1943.]

For years past the extensive pansy [*Viola tricolor*] plantings in the Vierlanden [Hamburg district] have suffered from stunting, wilting, and ultimate collapse, both seed-beds and transplanted stands being involved. The disease, said to be caused by *Pythium debaryanum*, begins with a dingy dark grey to blue-green discoloration of the leaf blades, sometimes mingled with a reddish-brown bronzing; later the foliage turns yellow or brown and shrivels, and the plants are easily pulled up from the soil, in which there is frequently only a remnant of the tap-root left. Control was effected by steam sterilization of the soil or disinfection with 1 per cent. formalin, 10 l. per sq. m.

HAWKER (LILIAN E.). **Notes on basal rot of Narcissus. III. Eradication of the disease from Narcissus stocks by repeated use of formalin in the hot-water bath.**—*Ann. appl. Biol.*, xxxi, 1, pp. 31–33, 1 pl., 1944.

In tests conducted at the Imperial College of Science Biological Field Station at Slough from 1939 to 1943, the amount of basal rot in stocks of *Narcissus* (varieties Bicolor Victoria, Spring Glory, Henry Irving, Glory of Leiden, and Grandis), naturally or artificially contaminated with *Fusarium bulbigenum* [*R.A.M.*, xxiii, p. 133], was reduced to negligible proportions by the addition of 0·5 per cent. formalin to the hot-water bath (usually applied against eelworm); while stocks given the hot-water bath without formalin were severely diseased. In most cases a single application of formalin was sufficient to produce these results, but one heavily infected stock had to be treated again after lifting the following season. In every case formalin treatment increased the weight and number of flowers and reduced the numbers of poor and missing plants and of bulbs rotting after lifting or in subsequent storage.

HORNBACK (E.). **Notes on resistance of Daffodils to virus diseases.**—*Herbertia*, ix, pp. 147–149, 1942 (published May, 1943).

In the author's nurseries in Oregon the daffodils may be grouped as follows in order of decreasing resistance to virus diseases: (1) *Narcissus tazetta* and hybrids, (2) *N. poeticus* and hybrids, (3) *N. cyclamineus* and hybrids, (4) *N. hispanicus* var. *maximus* and hybrids, (5) *N. jonquilla* hybrids, (6) old trumpet types and their hybrids, such as *N. minor*, *N. lobularis*, and *N. spurius*, (7) *N. triandrus* species and hybrids, (8) double varieties, except double *N. tazetta* hybrids and Poetaz and Poeticus varieties.

Attempts to spread the disease by mechanical means were only successful during a short period just before flowering.

McCulloch (Lucia). **A vascular disease of Gladiolus caused by Fusarium.**—*Phytopathology,* xxxiv, 3, pp. 263–287, 4 figs., 1944.

Since 1923 the writer has made observations on a destructive disease of *Gladiolus*, commonly known as yellows, wilt, or core rot [*R.A.M.*, xxiii, p. 300], and primarily involving the vascular tissues, which has spread from stock of Dutch origin grown in California, to most if not all regions of the United States where the host is grown. The causal organism, a variety of *Fusarium orthoceras*, enters the fibrous or contractile roots and corm base and advances upwards through the core, often without producing any external signs of infection until the later stages of the disease are reached, when bright, dark-brown lesions with pale reddish-brown margins appear on the corm surface. The colour of the diseased vascular tissue ranges from light to medium brown (cinnamon-buff to Saccardo's umber according to Ridgway) and its texture is fairly firm, woody, or tough. The fungus apparently develops in advance of the discoloration, since it can be isolated from externally normal vessels. A less typical condition of infected corms, variously designated as 'doughnut', 'high crown', or 'hollow core', is characterized by progressive browning, drying, and shrinkage of the core tissues from the base upwards, accompanied in extreme cases by large holes through the centre, which may destroy part or all of the root plate. A cavity of this type is usually widest at the base, tapering to ¼ to ½ in. or more in diameter at the top, and often including and killing the terminal buds. Its brown, hard, woody wall measures ½ to 2 mm. in thickness, the outer surface being smooth or occasionally extruding thorn-like projections into the sound, fleshy part of the corm. The entire hard, dry core is readily separable from the rest of the corm. Both the vascular and 'doughnut' type of infection originate in the field, the extent of the rot depending on the length of time between the onset of the disease and harvesting. Little or no enlargement of the cavity took place during the storage period in corms held at 5° to 10° C.

The first symptom of infection in the fibrous roots is a rusty, later dark to black discoloration, usually at the apex. The lateral roots die back, leaving a dark spot on the main root. Some of the new roots continuously arising from the root plate may escape infection: when the root plate is destroyed, roots often develop from parts above it as far as half way up the side of the corm. The diseased roots soon die, disappear, or are reduced to thin, wiry strands. Contractile roots, formed comparatively late in the season, appear to be less susceptible to vascular disease than the fibrous system. The red or red-brown streaks, ½ to 2½ in. long, occur mostly on the under side and are frequently overlooked; they may, however, spread and girdle the root. Dissection and staining showed the cortex to be the centre of infection, which extends in both directions and may reach the vascular tissue of the new corm.

The pathogen may be perpetuated either through diseased planting stock or infected soil. The former yields a poor crop or none, infection being transmitted directly from the parent corms to any new ones that may be formed. Healthy corms planted in contaminated soil contract the disease chiefly through the roots, or more rarely by way of the leaf bases.

The causal organism of the *Gladiolus* disease is assigned to *F. orthoceras* var. *gladioli* n.var. [a technical description of which is given in English only] on the basis of its host relationship. Experimental pathogenicity has been demonstrated in *Gladiolus* only, but a very similar species was isolated from *Montbretia* and *Tigridia* corms. The optimum temperatures for growth in culture and soil are 23° to 26° and 22° to 25°, though in soil inoculation tests infection occurred throughout the range from 15° to 32°.

In varietal reaction tests, 12 varieties proved resistant to the vascular disease,

30 moderately susceptible, and 11 highly so, the second group including Odin, a consignment of which from Holland was found to be infected in 1926.

F. orthoceras var. *gladioli* is eradicable from the soil with chloropicrin, but this method is expensive for large fields. The most promising means of control is the selection of resistant varieties, supplemented by the use of clean corms, fungicidal dips for planting stock, and planting in uninfested soil.

Cole (J. R.). **Low-lime Bordeaux mixture controls leaf gall on Azaleas.**—*Phytopathology*, xxxiv, 3, pp. 354–355, 1944.

For the past nine years Schley pecan trees in an experimental block near Albany, Georgia, have received four applications per annum of low-lime Bordeaux mixture, viz. from 10th to 23rd April, 4–1–100, and from 5th to 15th May, 1st to 15th June, and 1st to 15th July, 6–2–100, for the control of scab [*Cladosporium effusum*]. Surrounding two of the trees are nine plants of *Rhododendron obtusum*, which have incidentally been completely cured of leaf gall (*Exobasidium vaccinii*) [*R.A.M.*, xv, p. 229] and remained free from other fungal diseases, without suffering any damage from the spray though usually in full bloom at the time of the April application. On 10th May, 1943, 290 plants of *R. obtusum*, *R. macranthum*, and *R. micronulatum* infected by *E. vaccinii* were sprayed with 6–2–100 Bordeaux; a fortnight later most of the galls had shrivelled and become detached from the shrubs, and by 1st June the leaves had regained their green colour, and some new growth was in process of formation.

Smith (K. M.) & Markham (R.). **A virus disease of Lovage (Ligusticum scoticum).**—*Phytopathology*, xxxiv, 3, pp. 335–340, 2 figs., 1944.

In the summer of 1940 a fair-sized lovage (*Ligusticum scoticum*) bush in a garden in Cambridge, England, was observed to be showing typical mosaic symptoms including stunting and a bold, rather streaky foliar mottle. In inoculation experiments with the virus from tobacco, on which it induced severe necrosis, great difficulty was experienced in the infection of healthy lovage seedlings, only one out of 100 contracting the disease; on the other hand, 40 White Burley tobacco plants, 20 inoculated from lovage and 20 from tobacco, all developed systemic infection of equal intensity. Other plants successfully inoculated with the virus included Kawala Turkish tobacco, *Nicotiana glutinosa* (mild reactions), *N. sylvestris* (glassy spots, later developing a coppery ring), *N. langsdorffii*, *N. rustica*, and chilli (local lesions only in these three species), Kondine Red tomato (a symptomless carrier), *Datura stramonium* (very mild), Canadian Wonder French beans, English Wonder peas, ridge cucumber (destructive necrosis), *Lavatera trimestris* (very mild), and *Arabis hirsuta* (indeterminate symptoms). The very distinctive local lesions formed on *N. sylvestris* should fit this plant for quantitative studies on the lovage virus. Transmission is readily effected (except in the case of lovage itself) by means of sap. The virus succumbs in ten minutes to a temperature of 60° C. but withstands one of 55°. Positive infections were obtained at a dilution of 1 in 100 but not at 1 in 1,000. The virus resists a week's ageing at room temperature.

McKay (R.). **Scab on Pyracanthas and its control.**—*J.R. hort. Soc.*, lxix, 7, pp. 204–207, 5 figs. (between pp. xxxviii and xxxix), 1944.

From 1932 to 1936, and from 1941 to the date of writing, observations have been made on *Pyracantha* scab (*Fusicladium pirinum* var. *pyracanthae*) [*R.A.M.*, xvi, pp. 366, 515] at Glasnevin, Dublin. Symptoms of the disease, which may be responsible for severe damage and quite spoil the ornamental appearance of the shrub, include coating of the petioles with the felty, black, sooty masses of conidiophores and conidia, the latter measuring 13 to 21 by 6 to 10μ; chlorosis and shed-

ding of the affected leaves in the summer; and during the succeeding dormant season, spotting of the foliage with blackish lesions, 1 cm. in diameter, with dark red, Corinthian purple, or neutral red margins, and infection of the buds, and resulting in violent outbreaks on the new growth. In 1941 severe scab was observed on the fruit of *P. coccinea* and the current-season shoots were also defoliated while the remaining foliage was comparatively clean. On the internal surface of some of the bud scales and on the backs of young leaves in the terminal bud the fungus fructified freely, resembling apple and pear scab [*Venturia inaequalis* and *V. pirina*]. Effective control of the disease on *P. coccinea* and *P. lalandii* may be secured by spraying with lime-sulphur, at least two applications at 1 in 40 or 1 in 50 being given in the early spring, while the number of post-blossom treatments (1 in 80) should be determined by the prevailing climatic conditions.

Attempts to transmit the pathogen to apple and pear leaves gave negative results, thereby casting doubt on its supposed close relationship to *V. pirina*.

Weimer (J. L.). **Botrytis leaf spot of Vetch.**—*Phytopathology*, xxxiv, 2, pp. 245–249, 1 fig., 1944.

A disease of vetch in Florida and Georgia caused by a fungus of the *Botrytis cinerea* group is described. The species on which the original collection was made in 1940 at Gainesville, Florida, was *Vicia angustifolia*, and since then *V. sativa* has also been found naturally infected both in Florida and Georgia; *V. grandiflora* likewise proved to be susceptible in inoculation experiments, while *V. villosa* and *V. atropurpurea* were resistant. Broad beans and lupins (*Lupinus angustifolius*) were also attacked in the artificial infection tests, and are therefore unsuitable for inclusion in a rotation designed for the control of the leaf spot, which was further induced on four strains of *V. sativa*, viz., Willamette, Selection 7, Alba, and F.C. 18808, by a form of *B. cinerea* from lupin [*R.A.M.*, xxii, p. 360]. The pathogen produces on the leaflets, stems, petioles, and tendrils of susceptible species dark red (Ridgway's oxblood), sometimes with maroon, claret-brown, mahogany-red, or chestnut borders, rarely exceeding 1 mm. in diameter on the leaflets but attaining a length of up to 1 cm. on the stems and petioles.

Ulbrich (E.). **Massenauftreten eines Myxomyceten (Mucilago spongiosa [Leysser] Morgan).** [Mass development of a Myxomycete (*Mucilago spongiosa* [Leysser] Morgan).]—*Notizbl. bot. Gart. Berl.*, xv, pp. 311–315, 1941. [Abs. in *Zbl. Bakt.*, Abt. 2, cvi, 11–12, pp. 232–233, 1944.]

The Myxomycete *Mucilago spongiosa* was exceptionally widespread in the autumn of 1940 in Germany, where it damaged the second crop of meadow grasses, without, however, impairing their nutritional value, as demonstrated by tests on guinea-pigs. Other Myxomycetes assuming an injurious form at the same time included *Fuligo septica*, *Physarum gyrosum*, *P. cinereum*, and *Leocarpus fragilis*. A speedy and reliable control measure is a top-dressing of saltpetre.

Sinha (S.). **Studies in the decay of fruits in storage. I. Investigation into the causal organisms and sources of infection with a short note on the morphology of the fungi isolated. II. On the pathogenicity of certain fungi attacking Mango fruits.**—Abs. in *Proc. Indian Sci. Congr., 1943*, Part III, pp. 46–47, 1943.

In the course of studies at Lucknow on the fungal spoilage of stored fruits of mango, apple, pear, peach, pomegranate, orange, and grape, *Aspergillus niger*, *A. nidulans*, *A. fumigatus*, *A. tamarii*, *Penicillium atramentosum*, *P. fellutanum*, *Alternaria* sp. (Al 1), *Fusarium* sp. (F 1), *Rhizopus arrhizus*, and *Neocosmospora vasinfecta* were isolated from the surface. The tissues yielded 23 strains, including, besides seven identical with the superficial pathogens, *Acrothecium penniseti*,

Aspergillus candidus, *A. variicolor*, and *Colletotrichum capsici*. Mangoes, apples, oranges, and grapes in an apparently sound condition yielded a few of the organisms also occurring in the diseased tissues [cf. *R.A.M.*, xxii, p. 396], which were further isolated from the atmosphere of local storage places and mango orchards.

Infection by the fruit-rotting fungi appears to fall into two types, one taking place through wounds, lenticels, and the like, and causing immediate decay, and the other originating at an early stage in the growth of the host, but lying dormant until the maturation of the latter.

In inoculation experiments with *A. niger*, *A. nidulans*, *C. capsici*, and *Acrothecium penniseti* on two mango varieties stored at 15° and 30° C., the relative pathogenicity of the fungi was found to be influenced by the temperature and degree of maturity of the fruit, which kept well for relatively lengthy periods and sustained little damage under the cooler experimental conditions.

ANDREWS (E. A.). **The pathogenicity of a nonsporulating Basidiomycete on grasses in Minnesota.** *Phytopathology*, xxxiv, 3, pp. 352-353, 1 fig., 1944.

Fusarium sp., *Alternaria* sp., and a non-sporulating Basidiomycete were isolated from root-rotted crested wheat-grass (*Agropyron cristatum*) at Clear Lake, Minnesota [cf. *R.A.M.*, xxii, p. 313]. The pathogenicity of the last-named organism was tested at temperatures of 65°, 75°, and 85° F. on seeds of *A. cristatum*, *Bromus inermis*, and *Festuca elatior* sown in steamed soil inoculated with maize meal-soil cultures. The most severe damage to *A. cristatum* occurred at 85°, at which temperature only 16 per cent. of the seedlings (many of which failed to emerge in all three series) survived after 22 days. The other two grasses did not sustain appreciable injury from the fungus, which appears to be restricted to the crown of the root.

The Basidiomycete produces a dense, white mycelial mat on potato dextrose agar; the hyphae range from 3 to 6μ in diameter and are provided with prominent clamp-connexions. It grows more rapidly than the culturally divergent low-temperature Basidiomycete described by Broadfoot and Cormack from Alberta [ibid., xxi, p. 143], and further differs from *Typhula itoana* [loc. cit.] and the other *T.* spp. of Ruth Remsberg [ibid., xix, p. 434].

THORNE (D. W.) & WALLACE (A.). **Some factors affecting chlorosis on high-lime soils. I. Ferrous and ferric iron.** - *Soil Sci.*, lvii, 4, pp. 299-312, 1944.

In a comparative study at the Utah Agricultural Experiment Station of soil samples from areas producing (*a*) chlorotic and (*b*) green plants, those of the latter series were found to contain significantly more readily reducible iron and manganese than the former. Ferrous and ferric iron salts added to either type of soil were rapidly immobilized. Chlorotic Elberta peach, Bartlett pears, Jonathan apple, Concord grape [*R.A.M.*, xx, p. 557], and prune leaves contained more potassium and nitrogen and less iron and calcium than did green ones, the average iron content of the five kinds of fruit in the diseased and healthy groups being 115 and 132·4 p.p.m., respectively, and that of calcium 1·40 and 1·81 per cent., respectively. The iron content of peach and pear fruits from green trees appreciably exceeded that of those from chlorotic individuals (36·5 and 24·1 mg. per kg. green weight for peaches from healthy and diseased trees, respectively, and 21·8 and 14·8 mg., respectively, for pears). Hydrochloric, acetic, and formic acid solutions each extracted substantially more ferrous iron from green than from chlorotic foliage, while ferric iron was more readily reduced by green than by chlorotic leaf extracts and sap. The soil and plant conditions associated with chlorosis are thus evidently conducive to the maintenance of iron in insoluble ferric compounds.

Zobrist (L.), Conrad (R.), & Zogg (H.). **Untersuchungen über die Gloeosporium—Fruchtfäule an Kirschen.** [Investigations on the *Gloeosporium* fruit rot of Cherries.]—*Schweiz. Z. Obst-u. Weinb.*, liii, 8, pp. 145–151; 9, pp. 161–169, 8 figs., 1944.

Since 1939 the fruit rot of cherries caused by *Gloeosporium fructigenum* [*Glomerella cingulata*], hitherto of minor importance in Switzerland, has assumed a virulent form in parts of the canton of Thurgau, where entire orchards have been attacked; reports of its occurrence have also been received from the cantons of Basle and Aargau and isolated localities in those of Berne and Zürich. The Frühe Luxburger variety is the most susceptible, while Späte Basler and other hard-fleshed types are comparatively resistant. In inoculation experiments with spore suspensions of the fungus both wounded and unwounded fruits contracted infection. In 1942 and 1943 the disease broke out between 18th and 24th June, the first lesions being observed near the pedicel insertions on cherries in large, leaf-covered bunches. Diseased fruits shrivel and remain hanging on the trees in the form of mummies until the winter, when they gradually drop off, leaving the pedicels clustering on the shoots until the emergence of the new growth. Bud development in their vicinity is inhibited, and only one or two flowers are formed. In severe cases 40 to 60 per cent. of the dessert crop may be lost, the rotted fruits being fit only for distillation into cherry brandy. Attempts to combat the disease by the lime-sulphur sprays applied against shot hole [*Clasterosporium carpophilum*] were unsuccessful, while the special copper treatments given shortly before the harvest in 1942 also failed to prevent the decay of the fruits. In the following year the disease was effectively controlled by two post-blossom applications, between mid-May and mid-June, of lime-sulphur with the admixture of 0·5 per cent. virikupfer [copper oxychloride], but further experiments are necessary before a definite schedule of treatments can be laid down.

Mention is further made of three other pathogens affecting Swiss cherry orchards, namely, *Penicillium glaucum*, *Sclerotinia fructigena*, and the undetermined bacterial agent of grease spot [*R.A.M.*, xxi, p. 495].

Hildebrand (E. M.). **Mature Peach fruit affected by leaf curl.**—*Phytopathology*, xxxiv, 3, pp. 345–347, 1 fig., 1944.

Taphrina deformans, though common on young or semi-mature peaches in New York and elsewhere in the United States, has seldom been recorded on the ripe fruit. In September 1943, however, reddish lesions, covering $\frac{1}{8}$ to $\frac{3}{4}$ of the surface, were observed on Elberta peaches in an orchard in Niagara County, where the disease had not been effectively combated owing to the use of a deteriorated sulphur fungicide. Although the fungus usually attacked less than 5 per cent. of the fruits on a tree, an economic loss was sustained as a result of the ruling prices of $6.00 and upwards per bush. Attempts to demonstrate the presence of the pathogen in the lesions were unsuccessful, their negative outcome being in line with G. H. Cunningham's observation on nectarines in New Zealand [*R.A.M.*, ii, p. 373] to the effect that fructifications rarely develop in this type of infection.

Hansen (H. N.) & Rawlins (T. E.). **Cercospora fruit and leaf spot of Olive.**—*Phytopathology*, xxxiv, 2, pp. 257–259, 1 fig., 1944.

A species of *Cercospora* closely resembling *C. cladosporioides*, reported by Saccardo on olive leaves in Italy [*R.A.M.*, xviii, p. 604] and Algeria, has been isolated from purple-spotted, green fruits of the same host in California. The pathogen grows very slowly in culture, producing small, pycnidium-like structures containing minute, unicellular spores, possibly spermatia, attempts at the germination of which were unsuccessful, and later multiseptate conidia. The latter have also been observed on the discoloured spots on over-ripe fruits and growing out of the

stomata on the under sides of the leaves, which may be prematurely shed. Olives intended for pickling in the green stage had to be discarded on account of the spotting, which persists on the processed product, causing appreciable losses to the trade, but ripe fruits may be treated in the ordinary way notwithstanding the disease, since they undergo no deterioration of appearance or flavour, and are not injurious to health.

Report on the Department of Agriculture, St. Lucia, 1942.—14 pp., 1943.

In this report [cf. *R.A.M.*, xix, p. 717], it is stated (on p. 4) that there are probably fewer than 500 acres now cultivated to bananas in St. Lucia, and many of these are in a semi-abandoned condition. There was a very considerable increase in Panama disease (*Fusarium* [*oxysporum* var.] *cubense*) in both old (over three years) and new fields.

Appel (O.), Ed. **Sorauer (P.). Handbuch der Pflanzenkrankheiten. Pflanzenschutz. Verhütung und Bekämpfung der Pflanzenkrankheiten.** [Sorauer (P.). Handbook of plant diseases. Plant protection. Prevention and control of plant diseases.]—viii+732 pp., 184 figs., Berlin, P. Parey, 1941. [Abs. in *Rev. appl. Ent.*, Ser. A, xxxii, 6, p. 188, 1944.]

This second half of the sixth (final) volume of Sorauer's well-known text-book on plant diseases [cf. *R.A.M.*, xvi, p. 478] contains the subsection on biological control (pp. 1–120) and six further main sections. The first five of these comprise discussions by various authors on the equipment used in plant protection work (pp. 121–303), the methods and criteria employed for the determination of the soundness or otherwise of seeds or other planting material and the purity of resistant plant strains (pp. 304–361), the cultivation and breeding of pest- and disease-resistant varieties (pp. 362–406), the legislation in force against pests and diseases of cultivated plants in Germany and, more briefly, elsewhere (pp. 407–583), and the history and functions of the official bodies concerned with plant protection work in Germany and (less fully) other countries (pp. 584–632). The concluding section (pp. 633–664) contains lists of the principal monographs, journals, and serial and occasional publications in many languages dealing with different aspects of plant protection. An index to the whole of Volume VI is appended.

Morstatt (H.). **Beiträge zur Wirtschaftsgeschichte tropischer Kulturpflanzen und ihrer Krankheiten. I. Der Parakautschuk. II. Der Kaffee.** [Contributions to the economic history of tropical cultivated plants and their diseases. I. Pará Rubber. II. Coffee.]—*Kolon. Rdsch.*, xxxiv, pp. 14–22, 79–88, 1943. [Abs. in *Zbl. Bakt.*, Abt. 2, cvi, 11–12, pp. 209–210, 1944.]

The author's object in this series of papers is to emphasize a hitherto largely neglected aspect of the cultivation of tropical crops, namely, the influence of diseases and pests of such crops on the collective economy of the affected regions and hence on world market statistics. The history of the successful development of *Hevea* rubber in the Far East and the devastating effects produced by coffee rust (*Hemileia vastatrix*) in Ceylon and elsewhere in the eastern tropics, are discussed.

Morstatt (H.). **Krankheiten und tierische Schädlinge der Nutzpflanzen Afrikas.** [Diseases and animal pests of the economic plants of Africa.]—Reprinted from 'Afrika', viii, 147 pp., 56 figs., Berlin, W. de Gruyter & Co., 1942. [Abs. in *Zbl. Bakt.*, Abt. 2, cvi, 8–10, pp. 202–203, 1943.]

Following an introductory survey of the main problems of plant protection in the African colonies [cf. preceding abstract], the writer discusses the diseases and pests of the individual fibre-, oil-, tannin-, rubber-, food-, condiment-, spice-,

and drug-yielding plants in relation to cultural and environmental factors, control, and economic importance.

Botanical investigations at Rothamsted.—*Proc. Linn. Soc. Lond.*, clv, 3, pp. 236–244, 1944.

In this symposium of the botanical investigations carried on at Rothamsted since the inception of the Experimental Station in 1843 are the following contributions: Minor elements and plant growth, by W[INIFRED] E. BRENCHLEY (already noticed from another source [*R.A.M.*, xxiii, p. 78]); and The nature of plant viruses, by F. C. BAWDEN, briefly reviewing some outstanding discoveries regarding the attributes of these 'obligately parasitic pathogens, too small to be resolved by ordinary microscopical methods', since scientific study on tobacco mosaic was inaugurated by Ivanowski in 1892.

Manual of extension methods in plant pathology.—*Ext. Serv. Circ. U.S. Dep. Agric.* 411, 37 pp., 1943. [Mimeographed.]

This manual, prepared as a contribution of the Extension Subcommittee, War Committee, of the American Phytopathological Society, presents valuable information on extension methods for plant pathologists and should greatly assist them in the work of advising and training farmers for plant disease control. Well-known State and Federal plant pathologists have contributed chapters, drawing largely on their own experiences. Among others, R. J. Haskell outlines the scope of work of an extension plant pathologist and discusses the personal qualifications required; O. D. Burke writes about the 'method demonstration' as a teaching device; M. F. Barrus advises on the teaching of farmers by means of organized meetings and conducted tours; C. T. Gregory stresses the importance of press and radio in spreading information on plant diseases; and O. C. Boyd deals with the methods of conducting disease surveys.

FLEMING (A.) & SMITH (G.). **Some methods for the study of moulds.**—*Trans. Brit. mycol. Soc.*, xxvii, 1–2, pp. 13–19, 1944.

Excellent preparations of mould colonies can be obtained and preserved by cutting out disks of paper or cellophane, sterilizing them in an autoclave, placing them on the culture medium in a Petri dish, and then inoculating them in the centre. When the resultant colony has reached the desired size, the disk can be removed, exposed to formalin vapour, dried, and then mounted on a card or glass and protected with a glass covering. A flat spectacle lens blank, covered with a curved spectacle lens blank, may also be used in mounting. An additional advantage of cellophane disks is that, with some moulds, the colony floats off when the disk is placed on water or 10 per cent. formalin and can be transferred to a glass mount.

In observations of spore germination, small cellophane squares or disks were placed on a solid medium and mould spores planted on the surface of the cellophane. When growth had taken place for a sufficient time, a cellophane slip was removed and mounted in 10 per cent. nigrosin (containing formalin). For immediate examination the cellophane serves as a cover-slip, and the germinated spores stand out clearly on a dark field. For permanent record a slip with nigrosin added and dried may be mounted in Canada balsam.

For positive staining of recently germinated spores the best results are with lactophenol-picro-nigrosin, the preparation being sealed with Noyer's cement or any other suitable material. The cellophane strip may be stained with lactophenol-picro-nigrosin in a watch glass and mounted in lactophenol or de-stained in water, then carried through two changes of alcohol and mounted in Gurr's mounting

fluid. With older cultures with fruiting bodies the best results are given by lactophenol-picro-nigrosin staining, following by mounting in lactophenol.

For mounting moulds the most satisfactory medium for general use is lactophenol. Picro-nigrosin in lactophenol stains quickly and clearly, and the stain is not removed by replacement with plain lactophenol or treatment with alcohol or strongly acid reagents. The paper concludes with directions for sealing lactophenol mounts.

FANCUTT (F.) & TWISELTON (M. S. J.). **A method for determining mixtures of shirlan and *p*-nitrophenol in rot-proofed Cotton.**—*J. Soc. chem. Ind., Lond.*, lxii, 11, pp. 205–206, 1943.

Details are given of a method for determining the quantities of shirlan NA [*R.A.M.*, xxii, p. 136] and para-nitrophenol in cotton fabrics and the like, used in the manufacture of railway waggon sheets, which have been treated against rotting with mixtures of these two substances. Both are estimated colorimetrically by employing the indophenol reaction which occurs between shirlan and dimethyl-para-phenylenediamine and between para-aminophenol and ortho-cresol, respectively.

BOSE (S. R.). **Suspected symbiosis in Casuarina equisetifolia tree.**—Abs. in *Proc. Indian Sci. Congr., 1943*, Part III, p. 45, 1943.

A fungus of weak virulence, believed to be an Ascomycete, has been found occupying the cells of roots, stems, green branchlets, cones, and seed coats of healthy *Casuarina equisetifolia* trees in different parts of Bengal and Bihar and Orissa. On the germination of the seeds, the hyphae in the coat infect the seedlings and normal development takes place without the intervention of ecto- or ectendotrophic mycorrhiza. A close connexion has been established between the presence of tannin in the vicinity and hyphal formation in the trees. Ordinarily a state of well-balanced equilibrium appears to exist between host and fungus, but sometimes the latter assumes a virulent form and may kill the tree. Experiments on the germination of *C. equisetifolia* seeds in pure cultures of the fungus are in progress.

NOECKER (N. L.) & REED (M.). **Observations on the vitamin requirements of Stereum frustulosum (Pers.) Fr.**—*Amer. Midl. Nat.*, xxx, 1, pp. 171–174, 1943.

Studies on the vitamin nutrition of *Stereum frustulosum* showed that of thiamin, riboflavin, pyridoxin, and biotin only the first-named was of benefit to the fungus. It was as effective as yeast extract, its optimal dosage being 0·5 gamma per 25 ml. of culture medium. Thiazole was as effective as the whole molecule of thiamin. Small amounts of washed agar had a beneficial effect, this action being, presumably, physico-chemical.

SAKSENA (R. K.) & BHARGAVA (K. S.). **Nitrogen requirements and vitamin deficiencies of Phytophthora phaseoli Thaxter.**—*Proc. Indian Acad. Sci.*, xviii, 2, pp. 45–51, 1 fig., 1943.

In the writer's experiments at the University of Allahabad, a culture of *Phytophthora phaseoli* from the Centraalbureau voor Schimmelcultures, Baarn, Holland, made no growth on a medium consisting of mineral salts, dextrose, and inorganic nitrogen, but required a special amino acid (*d*-alanine), supplemented by thiamin. Other substances providing nitrogen in a suitable form included peptone, hydrolysed peptone, casein, buttermilk, lentil and yeast extracts, and Lima bean [*Phaseolus lunatus*] infusion, all of which, except casein, also supply the necessary growth substance.